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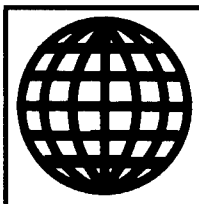

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UDC 612.014.4(15):796

Orthostatic Stability of Athletes of Different Specializations and Its Change As Produced by Lower Gravity

907C0050 Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 5, May 89, p 62

[Article by S. V. Dronenko]

[Text] Experimental research was done to evaluate the orthostatic stability of athletes of different specializations and the changes in that stability after a stint under conditions of lower gravity. Sixty healthy male volunteers aged 21-39 were studied. They were divided into five groups: I—gymnasts (7), II—decathlon competitors (9), III—basketball players (10), IV—swimmers (8), and V—healthy men not involved in sport (26). The conditions of reduced gravity were simulated by submersion into a "dry" immersion for three days.

In order to determine orthostatic stability before and after the immersion, a passive orthostatic test was conducted at +70° for 20 minutes. During the orthostatic test at minutes 1, 5, 10, 15, and 20 and during the recovery period at minutes 1, 5, and 10, the following indicators of central and peripheral hemodynamics were determined: stroke volume, pulse blood flow of the femur and crus (by the rheographic method), heart contraction rate (from ECG), systolic and diastolic blood pressure (according to Korotkov tones). Then the blood volume per minute, the total peripheral resistance, and the pulse and average dynamic blood pressure were calculated.

The athletes in groups III and I had higher orthostatic stability than did those in groups II and IV. Only the basketball players (group III) were found to be more stable with respect to the orthostatic effect than the nonathletes (group V), principally in terms of length of endurance of orthostatic tests.

The orthostatic stability of the members of all the groups was diminished as a result of the three-day immersion. However, the least pronounced changes were recorded among the gymnasts (their orthostatic stability was almost unchanged) and the nonathletes. The orthostatic stability of the remaining athletes suffered to a greater degree, especially among the decathlon competitors and swimmers. The research results indicate that athletes are less stable with respect to orthostatic action than are nonathletes. This, apparently, is related to the lowering in them of the capacity for adaptation of the blood-pressure regulating system. Thus, for example, the systolic blood pressure of swimmers during the orthostatic tests after immersion fluctuated from 123 to 103 mm Hg, whereas the systolic pressure of nonathletes was reduced about 8 mm Hg. The resistance of the peripheral vessels during orthostatic tests after immersion increased by 40-50 percent in basketball players and gymnasts only, and this maintained blood pressure at a satisfactory level.

Thus, as a result of immersion, weakening of the response of blood pressure to a change in transmural pressure occurs in athletes, and this agrees with the results of a number of foreign investigators (J. Stegman et al., 1974; K. E. Klein et al., 1977; P. B. Raven and M. L. Smith, 1984). However, training in different kinds of sport (gymnastics and basketball) provides opportune linking of compensation mechanisms for maintaining orthostatic stability.

UDC 613.693:612.766.1.08

Possibility of Using Evoked Brain Potentials to Diagnose Flight Crew Fatigue

907C0237A Moscow KOSMICHESKAYA BIOLOGIYA I AVIAKOSMICHESKAYA MEDITSINA in Russian Vol 23 No 4, Jul-Aug 89 pp 21-23

[Article by V. A. Ponomarenko, S. V. Yegorov and O. V. Zhernavkov]

[Text] Flight crew fatigue as a result of occupational activity is a traditional problem of aviation medicine. Finding dependable diagnostic criteria by which to detect early stages of development of this state remains an important issue.

The goal of this paper is to study the possibilities for using evoked potentials to diagnose fatigue among flight crews when they are performing their jobs.

The basic theoretical premise of this paper was the accepted fact that as fatigue develops, the physiological "price" of activity increases, reserve possibilities for processing additional information decline, and performance of a flying assignment worsens in the dynamics of pilot performance.[1-4,6] It has been established at the same time that the amplitude and temporal characteristics of averaged evoked potentials reflect parameters of assignment fulfillment such as complexity, level of stress during its fulfillment, and processes associated with information processing.[5,7,8,9] We hypothesized on this basis that predictable changes that may be utilized as diagnostic signs of fatigue should manifest themselves in the characteristics of an evoked response recorded to a stimulus which is indifferent in the context of the activity being performed and which is presented against the backdrop of developing fatigue. The parameters of an averaged evoked potential obtained in response to presentation of a signal that is irrelevant to the pilot and is transmitted directly in the course of the fulfillment of a flying assignment are apparently associated with the pilot's capabilities for perceiving and processing additional information. For example, the decline of the reserve capabilities of the individual that accompanies development of fatigue, one of the signs of which is reduction of the volume and rate of processing of additional information, can actually reflect itself in the characteristics of averaged evoked potential.

Methods

A 10-hour flight on a route with alternating cycles of manual and automatic control was modeled on a flight simulator. The duration of the experimental assignment was determined on the basis of published data indicating that during long flights, the first signs of flight crew fatigue appear after 10-12 hours of work.[1-2] Immediately prior to the beginning of the experiment, as well as after completing the route, each operator made two final landing approaches in positional control configuration.

Four essentially healthy operators possessing solid skills in piloting the trainer took part in the experiments. Each of them flew one or two simulated flights. Seven experiments were carried out in all.

An electroencephalogram (EEG) was recorded during the landing approaches themselves. It was recorded from a single point of contact at the vertex, with the indifferent electrode positioned on the right mastoid process. Interelectrode resistance following application of the sensors did not exceed 10 kOhms.

Auditory stimuli irrelevant to the operator (clicks) were used to obtain auditory evoked potentials (AEPs). The physical characteristics of these stimuli remained constant throughout the entire experiment. The interval between stimuli was 7 sec. Responses were registered by an EEG-4217 electroencephalograph made by Nihon Kohden and were subsequently recorded on a Sony FE-30A tape recorder. The averaging procedure was carried out by means of a program run on an SM-2 minicomputer. Segments of the EEG containing artifacts were discarded.

Traditional indicators were used in the analysis of averaged AEPs—the latent periods of isolated components and their amplitudes.

Before and after the experiment the operators used a special scale to evaluate the level of their feeling of fatigue.

The quality of activity associated with the landing approach was evaluated on the basis of an assignment fulfillment probability indicator P_{af}, which is the product of the probabilities of maintaining specific evaluated localizer-and-glidescope and velocity parameters, obtained by assigning tolerance limits for each of them.

Results and Discussion

AEPs with a configuration that remained relatively stable for each of the subjects over the course of the entire experiment were obtained from all operators as a result of averaging artifact-free EEG segments synchronized with transmission of the auditory stimulus. Twenty to 25 evoked responses to the stimulus were averaged in each mode depending on the quality of the recorded EEG. Visual analysis of the resulting AEPs showed that N_1 and P_2 waves with latent periods of around 90 and 175 msec, respectively, were the most pronounced components in their structure, which is consistent with published data.[10] Therefore, we selected the amplitude of the N_1P_2 (peak-to-peak) complex as the main indicator for our analysis of the dynamics of AEPs over the course of the experiment.

It was established that when an operator begins a landing approach, the amplitude of the N_1P_2 complex decreases reliably ($p = 0.01$) by an average of 28.3 percent in comparison with the amplitude in baseline recordings obtained in an at-rest state before the work. This is apparently associated with activation of information perception and processing during fulfillment of piloting tasks and, consequently, with an increase in the load on the central nervous system. Correspondingly, there is a diminution in the response evoked to a signal that is indifferent in the context of a specific activity and that reflects the capabilities for processing additional information.

Let us examine the results of comparative evaluation of AEP dynamics and of the activity quality indicator, recorded during landing approaches at the beginning of the experiment and after 10 hours of work (see table).

Change in Activity Quality Indicators and Amplitudes of the N_1P_2 Component of AEPs During Landing Approaches Performed Before and After a 10-Hour Simulated Flight Along a Designated Route (M+/-m)

Indicator	Prior to Flying the Route	After 10 Hours of Simulated Flight
P_{af}	0.59+/-0.13	0.36+/-0.11
Amplitude, in microvolts	15.12+/-2.58	11.43+/-1.17

The quality of landing approaches after 10 hours of flying worsens reliably ($p < 0.05$), which indicates a drop in the level of efficiency in the subjects. This process is probably associated with development of fatigue. Assessing their own condition after 10 hours of simulated flight on a designated route, all operators noted a moderate feeling of fatigue. Thus, the dynamics of the indicators examined above make it possible to conclude that in the conditions created in these experiments by the half-scale modeling of pilot activity during a long flight on a designated route, operators developed a state of fatigue manifesting itself both as worsening of the direct indicators of efficiency and as a characteristic feeling of fatigue arising during work.

We can assume on the basis of the data presented above that the figures in the table reflecting changes in amplitude of the AEP N_1P_2 complex are associated with development of fatigue. Comparative analysis of amplitudes of this component in the AEP structure during landing approaches at the beginning and the end of the experiment indicates presence of significant dynamics expressing themselves as a reliable decrease ($p = 0.05$) of this indicator by an average of 24.5 percent (with individual fluctuations from 13.2 to 58 percent for different subjects). Predictable changes were not detected in other amplitude and temporal indicators of the AEP.

In light of the fact that the amplitude of the AEP N_1P_2 complex drops when operators develop fatigue while performing landing approaches, we can note that it is apparently associated with a decline in the reserve capabilities of the individual. This process manifests itself as a decrease in the volume and rate of processing of additional information.[1,2,4,6] In view of its irrelevance to the operators, the auditory stimulus used in the experiments to obtain AEPs was in fact an indifferent signal in the context of the activity performed, and the parameters of the response to it should have been associated precisely with the individual's reserve capabilities. The rise in the physiological "price" of the work reflects a rise in the level of stress as a result of mobilization of effort to perform a particular assignment. Given this situation, the functional system supporting performance of the particular form of activity (in this case, a final landing approach) occupies the dominant position. It would be realistic to suggest that as a consequence of such a process, this system begins to operate as a dominant mechanism, inasmuch as the reduced level of reserve capabilities does not allow the operator to divert his attention to the performance of some other additional tasks. Accordingly, perception and processing of any additional signal is inhibited by the mechanism of negative induction, which should be reflected in the characteristics of the evoked response to such a stimulus. From our point of view, the drop in the amplitude of the N_1P_2 component of the AEP during activity carried out against the backdrop of developing fatigue reflects such a process, in view of which the proposed indicator may act as one of the diagnostic criteria of this state.

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UDC 613.693+629.78]:612

Psychological Preparation of Operators for Activity During Sustained G-Loads

907C0237B Moscow KOSMICHESKAYA BIOLOGIYA I AVIAKOSMICHESKAYA MEDITSINA in Russian Vol 23 No 4, Jul-Aug 89 pp 26-29

[Article by A. A. Oboznov, V. A. Ponomarenko and D. Yu. Arkhangelskiy]

[Text] As we know, the timely performance by an operator of protective measures—primarily the tensing at will of leg and abdominal muscles—prevents the development of visual disturbances accompanying g-loading and thus increases the reliability of his activity.[1,3] Therefore, the development of a special mental quality in the operator—the ability to divide one's attention between carrying out an operator task and performing protective measures—is the most important element in the psychological preparation of the individual for successful performance of operator tasks in conditions involving sustained $+G_z$ loads.[2] This means that the individual must develop a system of mental regulation which will enable him to carry out a priority operator task while performing protective measures. In our opinion, this system consists of two subordinated levels. The first, the dominant one, ensures conscious mental regulation of actions associated with carrying out an operator task; the second, the subordinate one, regulates simultaneous performance of protective measures without constant conscious control.

The goal of the work reported in this paper was to experimentally verify the possibility of developing a two-tiered system of mental regulation in ordinary conditions (in the absence of g-loading).

Methods

Two series of experiments were carried out. In the **first series**, which was carried out in ordinary conditions, operators used a laboratory testing unit to learn how to perform their main task—two-dimensional compensatory tracking of a spot moving on a prescribed trajectory on an electronic display screen. The testing unit had an adaptive circuit varying the brightness of the spot according to the promptness with which the operator performed his protective measures. (The adaptive circuit

was designed by V. V. Bogdanov and V. M. Vasilets.) Keeping the spot bright enough for the operator to confidently perceive its position on the screen required that he maintain constant tension in his leg and abdominal muscles throughout the entire tracking period. When muscle tension was insufficient, spot brightness decreased automatically, and perception of the spot became impossible. Consequently, operators could carry out their main task only if they maintained constant muscle tension. All of the operators (eight persons) were divided into two equal groups. Operators of the main group used the adaptive circuit, while operators of the control group carried out their tracking task without it. The **second series** of experiments was carried out on a centrifuge on which $+G_z$ acceleration with a magnitude of 5 units and a gradient of increase of 1 unit per second were achieved. In preliminary rotations on the centrifuge, the operators of both groups learned to perform the protective measures during g-loading without having to carry out the tracking task. Then all operators participated in seven or eight test runs (over the course of a month) during which they carried out the tracking task as well.

The duration of the tracking cycle was the same in the first and second series—60 seconds. An SM-2 computer was used to record momentary tracking error values—a total of 3,000 values in a 60-second tracking cycle. After statistical treatment of these data, we determined the mean (M) and the standard deviation (σ) of the tracking error, which served as the criteria of the effectiveness in the performance of the operator task. At the end of each series, the operators filled out a questionnaire in order to clarify the orientation of their voluntary attention.

Results and Discussion

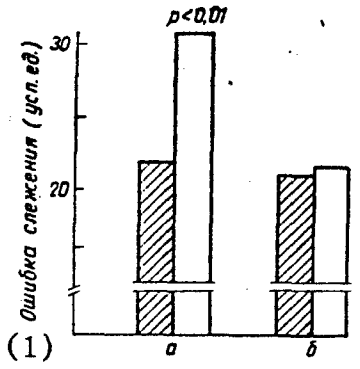
The results of the first series showed that the tracking precision attained on the laboratory testing unit by operators of the main group was the same as that attained by operators of the control group (see table). In this case the attention of operators of the main group was distributed precisely as had been expected: It was oriented primarily (constantly) on carrying out the tracking task and episodically on maintaining the necessary level of muscle tension in the legs and abdomen. The priority of attention division was different only for operator K. It is interesting that this operator's tracking precision was the lowest in the main group. The attention of operators in the control group was oriented on tracking the spot, as would have been expected. Consequently, when the operators in the two groups under comparison began to their tracking task under g-loading, they differed neither in tracking precision nor in their acquaintance with protective physiological measures, which all of them mastered to an equal degree in preliminary runs on the centrifuge. The difference lay in something else: the operators of the main group, unlike those of the control group, developed the ability to carry out the indicated forms of activity not only simultaneously, but also in the required hierarchy.

Spot Tracking Precision and Attention Orientation of Operators of the Main and Control Groups (on Laboratory Testing Unit)

Operator Group	Tracking Error (Arbitrary Units)		Attention Orientation
Main:	M	σ	Constantly on spot tracking
Kh.	18	10	Episodically on tensing of leg and abdominal muscles
K-v	20	10	As above
B.	24	13	As above
K.	32	21	Constantly on tensing leg and abdominal muscles; episodically on spot tracking
Group average	25	16	
Control:	M	σ	
S.	18	13	On spot tracking
F.	20	14	As above
D.	27	17	As above
S-n	28	17	As above
Group average	23	16	

The importance of this ability was demonstrated by the results of the second series of tests. As is evident from the figure, in the presence of $+G_z$ acceleration, the spot tracking precision of operators of the main group was an average of 1.4 times greater than that of the control group. The fact that the operators in the control group lacked the ability to combine both forms of activity in the required hierarchy may be the only reason for this difference.

The questionnaires revealed that in order to prevent visual disturbance under the $+G_z$ accelerations, operators of the control group were constantly devoting their



Tracking Error of Operators in First Two (a) and Last Two (b) Runs on the Centrifuge: Shaded columns—main group, unshaded columns—control; $+G_z$ = 5 units; averaged data.

Key: 1. Tracking error (arbitrary units)

attention to the performance of the protective measures, which is what was responsible for the considerable increase in tracking errors in the first test runs on the centrifuge. They were forced to learn how to simultaneously track the spot and perform protective measures in the course of the experiments themselves of the second series, and it was not until the last runs on the centrifuge that they were able to achieve the same spot tracking precision observed for operators of the main series in the very first test runs.

And so, the research results showed that in the course of preparing themselves on the laboratory testing unit, operators of the main group developed a two-tiered system of mental regulation which enabled them to carry out the priority spot-tracking task while simultaneously performing protective measures. Formation of such a regulatory system was made possible, to a decisive extent, by the use of the adaptive circuit that varied the brightness of the spot being tracked. Thanks to the adaptive circuit, performance of the protective measures was regulated predominantly in a "stimulus-response" scheme: Whenever the brightness of the spot decreased, the operators learned to increase muscle tension. Moreover, the signal "triggering" the increase in muscle tension was combined in space with the signal regulating performance of the tracking task. The movements of the spot on the screen were used to develop the controlling movements used to track it, while change in spot brightness was used to maintain the prescribed level of muscle tension. Thus, the necessary prerequisites for carrying out the protective measures were created psychologically at the habit level, freeing the dominant, conscious level of mental regulation to handle the priority operator task.

This research demonstrated the fundamental possibility of shaping in a deliberate fashion an individual's ability in ordinary conditions to combine operator tasks with protective measures, and it experimentally demonstrated the importance of this ability to raising the efficiency of operator activity under sustained $+G_z$ loading.

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UDC 629.78:[613.31:613.27]-07

Artificial Mineralization of Desalinized Drinking Water With Salt Tablets and Powders

907C0237C Moscow KOSMICHESKAYA BIOLOGIYA I AVIAKOSMICHESKAYA MEDITSINA in Russian Vol 23 No 4, Jul-Aug 89 pp 74-76

[Article by M. I. Shikina, T. I. Aladinskaya, L. N. Volkova and Z. A. Dupik]

[Text] As we know, desalinized water is close in physical and chemical composition to distilled water and does not contain physiologically necessary mineral components and trace elements such as calcium, magnesium, potassium, sodium, sulfates, chlorides, iodine, and fluorine commonly found in natural drinking water. Desalinized water is deficient in terms of its organoleptic properties and salt composition, which is why it must be mineralized artificially.[1-6]

An in-depth study of the effect of water desalinized by various methods on the body has made it necessary to adopt a hygienic approach to standardizing its salt composition on the basis of physiological criteria of optimum, permissible and threshold levels of mineralization, with allowances made for the particular features of the physical and chemical composition of water in different zones of a climatic belt.[2]

The need for especially precise dosing of salt additives and trace elements imposes higher requirements on the methods being developed for artificial mineralization of water. One promising method is to condition water by adding salt tablets to it. Previously, we developed Akvasol [Aquasol] tablets, which were used by mountaineers for salt enrichment of melted glacial water on high-altitude expeditions involving the ascent of Mt. Everest.[6] The tablets consisted of magnesium sulfate, sodium chloride, potassium chloride, potassium iodide and sodium fluoride ions in concentrations improving the organoleptic properties of enriched water and

making its physical and chemical composition similar to that of Moscow tap water in terms of the main components. However, these tablets did not contain salts having important physiological significance. The objectives of our research were to adjust the salt composition of Akvasol tablets so that they meet the new hygienic recommendations and to conduct a series of experiments in order to study the possibility of introducing various calcium salts into their composition.

Methods

The water solubility of salts (sulfate, gluconate, carbonate) at room temperature was studied. Dissolution time of calcium suspensions in water (with and without stirring), water transparency, and calcium ion concentration were evaluated by methods commonly used in analytical practice, and the conditions for manufacturing tablets out of salt powders containing calcium salts combined with magnesium sulfate, potassium iodide, potassium chloride and sodium fluoride in the proper concentrations were studied (using chemically pure reagents). Various substances commonly used to manufacture medicines were used as fillers promoting formation of tablets out of powders, though at less than pharmacopoeia concentrations (0.4 percent of powder weight, rather than 20 percent). These substances included starch, polyvinyl pyrrolidone (PVP), gelatin, methylcellulose (MC) and calcium stearate. Fillers were added to increase the binding capacity of salts in the tablets and to increase their slipperiness in the tablet press. The additives should not affect the physical and chemical composition or the transparency of the water. After the fillers and salts were mixed together, the mixture was dried and passed through a sieve. Tablets of the mixtures containing the indicated chemical ingredients were made on an Engler laboratory tableting press at a pressure of 1,200 kg/cm^2 at facilities of the Moskhimfarmpreparat Chemical and Pharmaceutical Production Association.

Results and Discussion

Tables 1 and 2 give the results of research on artificial mineralization of distilled water by means of powders and tablets containing sparingly soluble calcium salts combined with fillers. It follows from the data in the table that $CaCO_3$ was unsuitable for artificial mineralization of water in connection with its low solubility (it did not dissolve for 5 days).

Table 1. Results of Research on Artificial Mineralization of Water by Means of Powders

Powder Composition	Powder Weight, in grams	Dissolution Time		Transparency	Ca, mg/liter	Chemical Absorption of Oxygen (CAO), mg O_2/liter
		With Stirring	Without Stirring			
Ca gluconate, MC, Ca stearate	0.5	80 min	50 min	Precipitate, floccules	38.5	380
Ca gluconate, gelatin	0.5	15 min	40 min	Precipitate, floccules	39.5	380
Ca gluconate, gelatin, Ca stearate	0.5	15 min	35 min	Floccules	35.2	350
Ca gluconate, starch, soluble salts	0.5	10 min	30 min	Floccules	38.6	320
Ca gluconate, MC	0.5	20 min	50 min	No precipitate, transparency > 30 cm	40.08	380
Ca gluconate, PVP	0.5	15 min	45 min	Precipitate	38.2	320
Ca gluconate, PVP, Ca stearate	0.5	15 min	40 min	Precipitate	40.1	320
$CaSO_4 \cdot 2H_2O$	0.12	60 min	6 hr	No precipitate, transparency > 30 cm	28.0	0
$CaSO_4 \cdot 2H_2O$	0.15	80 min	6 hr	No precipitate, transparency > 30 cm	28.0	0
$CaCO_3$	0.1	Did not dissolve completely in 5 days		Precipitate	4.0	0

Table 2. Results of Research on Artificial Mineralization of Water by Means of Tablets

Tablet Composition	Tablet Weight	Dissolution Time		Transparency	Ca, mg/liter	CAO, mg O_2/liter
		With Stirring, in min	Without Stirring, in hr			
Ca gluconate, starch, soluble salts	0.64	15	4	Turbid solution (precipitate)	52.1	450
Ca gluconate, PVP	0.63	20-30	5	Precipitate	52.1	525
Ca gluconate, PVP, Ca stearate	0.68	25-30	6	Precipitate	56.1	575
Ca gluconate, gelatin, Ca stearate	0.55	20	6	Turbid solution	45.0	420,8
Ca gluconate, gelatin	0.523	10-15	5	Turbid solution (floccules)	44.0	425
Ca gluconate, MC, stearate	0.632	35	6	Low	55.0	500
Ca gluconate, MC	0.595	35	7	No precipitate, transparency > 30 cm	50.1	425

Calcium gluconate was found to be the most soluble in water. Out of the seven recipes studied, only the combination of calcium gluconate and MC was able to maintain water transparency, while other fillers reduced water transparency. The dissolution time of calcium gluconate in water (at a calcium ion concentration of 50 mg/liter) was 35 min with stirring and 7 hr without stirring. A considerable increase in bichromate oxidizability in water (up to 430 mg O_2/liter) because of the dissolution of calcium gluconate, which is an organic compound, was a shortcoming. This was not in keeping with the hygienic requirements for drinking water, even though calcium gluconate is beneficial to the body and is used in medicinal practice to treat a number of illnesses associated with deficiency of calcium ions in the body. The dissolution time of calcium sulfate ($CaSO_4 \cdot 2H_2O$) in water was 60-80 min with stirring and 6 hr without stirring, the water maintained its transparency, the concentration of calcium ions was 28 mg/liter, and calcium sulfate did not affect bichromate oxidizability of water (chemical absorption of oxygen—CAO, mg O_2/liter). Of the salts we studied, calcium sulfate was found to be the most acceptable for inclusion into the composition of the salt mixture, in combination with sodium chloride, potassium chloride, magnesium sulfate, potassium iodide and sodium fluoride. Medium-strength Akvasol-2 tablets were made on the basis of this research. They improved the organoleptic properties of desalinized water and enriched it with a complex of physiologically necessary macroelements and trace elements.

The weight of one Akvasol-2 tablet, which can enrich 1 liter of water, is 0.5 gm, and dissolution time without stirring is 12 hours. Water regenerated from peroxide solution was similar in composition to distilled water prior to enrichment; after enrichment, it had the following physicochemical composition: total hardness 4.3 mg-equiv/liter, calcium ions 64.12 mg/liter, magnesium ions 13.3 mg/liter, pH 6.25, chlorides 49.7 mg/liter; the CAO was 3.5 mg O_2/liter. Thus, Akvasol-2 tablets make it possible to adjust the composition of desalinized water to that of drinking water satisfying modern hygienic requirements.

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The Mechanism of the Drug Resistance of *Escherichia* in Cosmonauts

907C0237D Moscow KOSMICHESKAYA BIOLOGIYA I AVIAKOSMICHESKAYA MEDITSINA in Russian Vol 23 No 4, Jul-Aug 89 pp 90-91

[Article by V. K. Ilin]

[Text] Numerous studies have shown that the risk of falling ill to infectious diseases grows significantly

among people in biological isolation. This shows up in the activation of the conditionally pathogenic component of human automicroflora,[2,8] the weakening of the colonization resistance barrier,[9] and the weakening of the immune system.[4] Intensive microbial exchange occurs between people occupying hermetically sealed spaces.[3] All of these facts attest not only to the possibility of development of infection in people in biological isolation, but also to the fact that the prerequisites for the transfer of the etiological agents of infectious diseases from their source to surrounding people are created under these conditions. The value of antibiotic therapy of bacterial infections in hermetically sealed spaces remains open in this connection. The success of this therapy may depend on the etiological agent's sensitivity to antibacterial preparations and on presence of plasmids providing resistance to antibiotics in the microbial population or association in question.

This paper examines the molecular epidemiological features of changes in drug resistance of *Escherichia* isolated from the intestines of cosmonauts during space flight and from subjects participating in a 30-day simulation study.

Methods

Escherichia strains were isolated from the intestines of cosmonauts 7 days before flight and on the second day after the conclusion of the flight. An expedition visited the crew staying aboard the Salyut-7 orbital station on a long-duration space expedition. Isolated strains were studied for their sensitivity to antibiotics having a broad spectrum of action: tetracycline, levomycetin, streptomycin, kanamycin, neomycin, monomycin, ampicillin, carbenicillin, polymyxin and gentamicin. Sensitivity was determined from the minimum inhibiting concentrations.[6] Conjugation was carried out in liquid nutrient media using *Escherichia coli* C-600 as the R-plasmid recipient. Plasmids were studied by electrophoresis in agarose gel.[5] A total of 450 strains of *Escherichia* were studied.

Results and Discussion

E. coli resistant to tetracycline, levomycetin, streptomycin, kanamycin, neomycin, monomycin, ampicillin and carbenicillin was isolated in the largest amounts from the intestine of one of the members of the visiting expedition. All determinants were transferred *in vitro* with a frequency of 1×10^{-4} to 2.5×10^{-5}. Isolated plasmids had a molecular weight of 65 mD. They had a capacity for spontaneous elimination, and different resistance determinants were eliminated at different frequencies. This was indirect evidence that the plasmids in question are cointegrates of several plasmids. The determinant for resistance to tetracycline was found to be extremely stable, and it was eliminated neither spontaneously nor in response to an eliminating agent such as ethidium bromide. The determinant for resistance to tetracycline was not transmitted upon conjugation of the recipient strain *Escherichia coli* C-600; however, it could be mobilized for transfer with the assistance of plasmid R, DRD_{19}.

After the flight, a large quantity of *E. coli* cultures isolated from the main expedition crew were resistant to tetracycline. Prior to the flight, tetracycline-resistant strains were not revealed among participants of the main expedition, from which we can hypothesize that these strains appeared in the composition of the intestinal microflora of the subjects only as a result of microbial and plasmid exchange with participants of the visiting expedition. Plasmids isolated from tetracycline-resistant strains were nonconjugative. Therefore, we hypothesized that they are segregants of a polyresistant plasmid, presumably the one which was isolated from one of the members of the visiting expedition. In order to prove, this we conducted restriction analysis of tetracycline-resistant clones of this plasmid, obtained *in vitro* by the prescribed method (using ethidium bromide action upon polyresistant strains), and tetracycline-resistant plasmids isolated from cosmonauts of the main expedition following the flight. Our electrophoretic analysis demonstrated that the plasmids in question are completely the same. This proves the possibility of mutual exchange of resistant strains containing R-plasmids during space flight. This conclusion is also confirmed by the fact that production of the same restrictase, an isomer of type 2S restrictase Eco 311, was determined by both plasmids.

A similar situation was examined in a 30-day simulation study. In this study, a plasmid determining resistance to the same set of preparations as in the space flight examined above was allowed to propagate for 7 days in four subjects. This plasmid was eliminated over the course of 12 days of the study. On the 19th day it was not encountered among strains which were characterized previously, on the 7th day, by drug resistance and which contained this plasmid. Eliminants maintained their resistance only to tetracycline. It was concluded from electrophoretic analyses that the determinant for resistance to tetracycline was represented by a transposon associated with the plasmid and inverted following its elimination into a chromosome. Restriction analysis revealed common DNA fragments of the initial plasmid and the transposon.

We were unable to insert the initial plasmid into the genome of those strains from which the plasmid had been eliminated over the course of the simulation research; therefore, we hypothesized that this plasmid, which survived in part of the population, was unable to return to its initial hosts, and most likely introduced itself into the genome of some transient strains alien to the biotope in question. Our hypotheses were confirmed, inasmuch as we discovered this plasmid on the 21st day of the model research in lactose-negative, hemolytically active strains of *E. coli* which had formerly not possessed drug resistance. Restriction analysis of these plasmoid strains revealed that they contained a plasmid homologous to the initial plasmid.

Thus, it was discovered that both of the examined situations—in space and in terrestrial conditions—were similar as far as microbial and plasmid exchange is concerned when people spend lengthy periods in biological isolation.

This research provides a possibility for tracing the mechanism of changes in drug sensitivity from the standpoint of mutual exchange of R-plasmids and their variability. In the opinion of foreign and Soviet scientists,[7] it is energetically expedient for a microbial cell to lose an R-plasmid in the absence of selection, inasmuch as it takes a rather large quantity of energy to replicate R-plasmids. However, via the concept of "marker saving,"[1] a plasmid may move to other microorganisms, including potentially pathogenic ones with an energy potential that is considerably greater than that of saprophytic microbes. We also feel that in the course of plasmid drift in different populations and biotopes, a pathogenicity determinant accumulates on them, and resistance determinants associated with them accumulate passively. For example, the two large R-plasmids we studied mobilized the determinants for production of exonuclease, restrictase and colicin, i.e., the determinant for pathogenicity and colonization resistance. At the same time, the pathogenicity of the analyzed strains did not always correlate with the quantity of determinants for resistance to antibiotics. Therefore, we do not have sufficient grounds for treating the polyresistance index as an integral indicator of the degree of its pathogenicity. At the same time, the goal of our subsequent research will be to study the mutual relationships between the determinant for resistance to antibiotics and the pathogenicity of the automicroflora of cosmonauts.

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UDC 579.64:631.46

Formation of Nodules on Roots of Carrots Inoculated by Azospirillae

907c0385a Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 51 No 5, Sep-Oct 89 pp 11-16

[Article by Ye. V. Nadkernichnaya, A. Ye. Mamchur and V. I. Lokhova; Ukrainian Scientific Research Institute of Agricultural Microbiology, Chernigov]

[Abstract] A study of the capacity of the Azospirillum genus to cause formation of nodules on carrot roots involved application of an aqueous suspension of Azospirillum brasilense 21, the titer of which was 10^9 per ml of suspension, to hand sown carrots at the rate of 50 ml per linear meter of area planted in carrots. Electron microscopic studies of the nodules formed showed that their tissue consists of coarse oval cells with a large central vacuole, thin walls and a thin parietal layer of cytoplasm. No pathological changes nor bacteria appeared in the conducting root tissues found in the central part of the vacuole. Readily staining polymorphic structures, bacteria, appeared frequently in cells directly adjacent to the intercellular space. Fissile bacteria appeared in these cells. The bacteria pass from one cell to another through breaks in the cell wall. Bacteria appeared also in the intercellular spaces and in the invaginations between the plasmalemma and the cell wall and in voluminous cavities obviously of lysigenous origin, confined by the thick cell wall. Associative nitrogen-fixers of A. brasilense 21, penetrating the carrot plant roots, can cause formation of nodules which serve as a place of localizing bacteria and are characterized by high nitrogen-fixing activity. Figures 7; references 13: 7 Russian; 6 Western.

UDC 579.66.017.7:663.1

Production of Protein Feed from Straw and Other Byproducts

907C0533B Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 2, Feb 90 (manuscript received 30 Aug 89) pp 82-88

[Article by M. O. Zeltinya, M. P. Leyte, A. Ya. Apine, Yu. E. Shvinka, U. E. Viyestur and R. G. Katkevicha, Institutes of Microbiology imeni A. Kirkhenshteyn and of Wood Chemistry, Latvian Soviet Socialist Republic Academy of Sciences]

[Abstract] A brief review is provided of the use of straw and other lignocellulose agricultural byproducts for the production of protein. In particular, cursory description is provided of a method for NaOH digestion of milled straw for the growth of Trichoderma viride. The process, as developed on a pilot plant scale, yields 202.53 kg of dry biomass from one ton of straw, which contains 101.26 kg of microbial biomass or 41.72 kg protein. Maintenance of swine on this product as the primary feed for 2 months had no adverse effects and yielded a weight gain of 2 kg per animal. Figures 3; tables 3;

references 13: 5 Russian, 8 Western.

UDC 579.68(262.5)

Methane Utilization by Methanotrophic Bacteria Immobilized in Carrageenan Gel

907C0544A Moscow MIKROBIOLOGIYA in Russian Vol 58 No 6, Nov-Dec 89 (manuscript received 5 Oct 88) pp 903-908

[Article by Ye. N. Sokolova and N. F. Galchenko, Institute of Microbiology, USSR Academy of Sciences, Moscow]

[Abstract] An analysis was conducted on the efficiency of methane conversion into protein by methanotrophic bacteria immobilized in carrageenan gel in conjunction with the development of a method for protein analysis under these conditions. The data demonstrated that immobilization of Methylomonas methanica 12 (MM) and Methylosinus trichosporium 44 (MT) reduced the efficiency of methane oxidation to CO_2 to 14.4 and 7.7 percent, respectively, from the level in solution. However, protein synthesis diminished by only a third. In terms of metabolic efficiency, i.e., methane oxidation + protein synthesis, the productivity of immobilized MM and MT decreased by 76 and 37 percent, respectively. The method found suitable for protein determination involved removal of carrageenan by 0.9 percent NaCl in 1 M HCl at 90°C for 15 min, centrifugation, treatment of the sediment with acetone, recentrifugation, and solubilization of the sediment in 1 M NaOH. Color was developed by addition of Coomassie blue and determination of the optical density at 595 nm in a colorimeter. Figures 3; tables 2; references 15: 6 Russian, 9 Western.

UDC 616.931:312.2(470.45)

Diphtheria Morbidity in Volgograd Oblast

907C0232 Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 6, Jun 89 pp 32-32

[Article by V. N. Lazarev, Yu. A. Zheludkov, V. F. Obekhov, Ye. A. Ioannidi and I. Kh. Giniyatullina, Department of Infectious Diseases, Volgograd Order of the Red Labor Banner Medical Institute]

[Text] Growth in the morbidity due to diphtheria infection in our country has been noted in the last decade; it is associated with a decline in epidemiological alertness and in the level of collective immunity.[1-3]

In Volgograd Oblast, the diphtheria morbidity index has increased since 1981 to 0.63 per 1,000 population. Sporadic morbidity dominated. A total of 58 patients were registered with diphtheria of the mouth. Most of them were between the ages of 17 and 60, with the average at 20-40 years, and there were eight school-aged children.

The infection source was established as an adult patient infected in Siberia. The rest of the patients did not travel outside the oblast. Bacteriological tests of persons with whom they were in contact did not produce any positive results. Diphtheria was recorded mainly among urban residents.

It was established from an analysis of the disease histories that the patients presented for medical care promptly. However, it was not until days 3-6 of illness that a diagnosis of diphtheria of the mouth was established, basically when bacteriological test results were received. Even when a typical clinical picture was present and the disease agent was isolated, patients were sent to the hospital with a diagnosis of lacunar or follicular angina plus presence of toxigenic diphtheria bacillus.

In the hospital, the localized form of diphtheria of the mouth was diagnosed in 54 patients, while toxic diphtheria was diagnosed in four. Serum and antibacterial therapy were carried out with the clinical form, while detoxification and hormonal therapy were carried out in the presence of toxic forms. Antidiphtheria serum was not injected into the mouth of admitted patients after the inflammatory process abated. Patients were released after the established time if the bacteriological test result was negative. Repeat isolation of the disease agent did not occur, and the patients did not become chronic carriers as a result of sporadic morbidity. Four patients with toxic forms of degree I-III diphtheria of the mouth died. The cause of death was diffuse myocarditis, while one patient additionally suffered paralysis of respiratory musculature.

Three outbreaks of diphtheria infection were recorded in this period in a psychiatric hospital. Five patients fell ill in 1982, and 2 years later another eight fell ill, with an interval of half a year. In the last case the infection source was identified as a female patient that was a carrier of toxic diphtheria bacillus in the period of the second outbreak, in connection with which she underwent treatment in an infection hospital. A toxigenic culture was once again isolated from her when she entered the psychiatric hospital. Among patients who came in contact with her, one developed the localized form of diphtheria of the mouth, while two became healthy carriers.

Thus we noted "maturing" of diphtheria infection, predominant morbidity in cities, dominance of sporadic cases of illness, and a high proportion of late diagnoses owing to absence of epidemiological alertness on the part of polyclinic physicians, which results in delay of specific therapy and growth of mortality.

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Incidence of Antibodies to Delta Virus Among HBsAg Positive Individuals Various Populations of Region With Moderate Incidence of Hepatitis B

907C0550B Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 6, Nov-Dec 89 (manuscript received 27 Dec 88) pp 675-679

[Article by S. V. Zhavoronok, Vitebsk Medical Institute]

[Abstract] An analysis was conducted on the incidence of HBsAg and anti-delta antibodies (ADA) positive individuals in Belorussia, an area with a moderate incidence of hepatitis B. Serologic data showed that among blood donors the HBsAg positive rate was 4.3 percent, with 3.3 percent positive for ADA. The incidence of HBsAg or ADA positive individuals among medical personnel was 14.1 and 8 percent, respectively. In addition, 39.7 percent of familial contacts of HBsAg positive individuals were themselves positive for HBsAg, while 6.8 percent were positive for ADA. A positive rate of 14.3 to 35.5 percent was observed for ADA and HBsAg among patients with tuberculosis, rheumatoid arthritis, diabetes mellitus, and hematologic conditions. Finally, 55.8 percent of the patients with active chronic hepatitis and cirrhosis were HBsAg positive, while 42.5 percent were positive for ADA. Considering the fact that the respective seropositive results for HBsAg and ADA in patients with acute hepatitis B were 90.8 and 5 percent, the

difference underscores the adverse impact of an intercurrent infection with the delta agent. Tables 1; references 14: 10 Russian, 4 Western.

UDC 616.61-002.151-022:578.833.29]-036.21

Natural Foci of Hemorrhagic Fever with Renal Syndrome in Northwestern Region of European USSR

907C0550G Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 6, Nov-Dec 89 (manuscript received 17 Oct 88) pp 702-704

[Article by L. A. Avtushenko, Ye. V. Ryltseva, V. A. Shibalov and Ye. A. Tkachenko, Antiplague Station, USSR Ministry of Health, Leningrad; Institute of Poliomyelitis and Viral Encephalitides, USSR Academy of Medical Sciences, Moscow]

[Abstract] Lung suspensions prepared from 8,061 rodents and insectivores representing 23 species were assayed for hemorrhagic fever with renal syndrome (HFRS) antigen between 1984 and 1987 in order to determine the carrier rate in the northwestern regions of European USSR. The study, encompassing northwestern RSFSR, Estonia, Latvia, and Lithuania revealed that the incidence of HFRS positive animals was 2.7 percent. Serotype 1 was the dominant subtype, followed by serotype 2. The findings confirmed the fact that this area of the USSR constitutes a natural endemic focus of HFRS. Tables 1; references 3 (Russian).

UDC 616.9-022.39+616.9-036.21]-084.4(47+57)

Morbidity of Zoonotic and Natural-Focal Infections and Problems in Their Prevention in the USSR

907C0573A Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOLOGII in Russian No 12, Dec 89 pp 106-198

[Article by A. I. Kondrusev and Yu. M. Federov, USSR Ministry of Health, Moscow]

[Text] At a time of the continuing development of important territories of the country, land reclamation projects, intensive cattle breeding, and environmental protection projects, zoonotic and natural-nidal diseases have acquired particular urgency.

The morbidity of the most important zoonotic and natural-focal infections during the period from 1970 to 1988 is shown in the Table.

The recently observed rise in the incidence of zoonotic and natural-focal infections and the specific changes in their epizootology and epidemiology have dictated the need to improve measures to control those infections.

An important element of anti-epidemic measures that are presently being undertaken is the epidemiological monitoring of such infections. This may be defined as a multifaceted study of a specific disease, its hosts and etiological agent carriers, the degree of the population's susceptibility, and the entire complex of natural and social factors that determine the incidence of infections among animals and humans.

Morbidity of Zoonotic and Natural-Focal Infections in USSR Population

Nosological form	Average of yearly cases recorded at various periods						
	1970-1974	1975-1979	1980-1984	1985	1986	1987	Preliminary data for 1988
Brucellosis (diagnosed for the first time)	1772	2667	4283	5092	5389	5409	5117
Tick-borne encephalitis	1496	2071	2658	2723	2991	3955	2909
Hemorrhagic fever with renal syndrome	-	-	2825	11,424	7603	2780	8274
Leptospirosis	1145	696	1516	1630	1389	1132	2211
Rickettsiosis	3296	2771	2995	1973	1760	1739	1746
Siberian ulcer	515	411	260	178	233	199	254
Tularemia	103	234	337	133	190	164	163
Rabies	83	58	67	70	31	53	
Plague	2	0.8	1	0	1	1	1

Epidemiological monitoring is the basis for the rational planning, implementation, and evaluation of the effectiveness of measures taken to control these diseases. Such monitoring also provides for the efficient adjustment of anti-epidemic measures and periodic forecasting. The practice of epidemiological investigation of zoonotic infection focal points in its present form, however, requires improvement. At the present time such investigations are not undertaken in connection with diseases in animals creating a risk of human infection, but rather after human infection has been identified. In the case of zoonotic infections investigation of the nidal

area must be undertaken from the moment that the potential source for human infection is identified, i.e., as soon as a sick animal is discovered and as soon as an identification is made of infected carriers or transmission factors that can contribute to the risk of human infection, the investigation must take on an epizootological-epidemiological character.

A network of specialized anti-plague institutions (29 stations and 6 scientific-research institutes) and 177 departments for particularly dangerous infections at medical-epidemiology stations has been organized to undertake daily measures for the prevention of natural-focal, zoonotic, and a number of other particularly dangerous infections in the country. This kind of branched system of institutions situated in the territory of natural breeding grounds of the plague, tick-borne encephalitis, zoonotic mucocutaneous leishmaniasis, and tularemia makes it possible to maintain constant epidemiological well-being in a territory of the country. The currently operating system of monitoring natural breeding areas of the plague in the USSR constitutes an example of the effective practical implementation of epidemiological monitoring of zoonotic infections. The direct subordination of the anti-plague institutions to the USSR Ministry of Health makes it possible to maintain a high state of anti-epidemic readiness and mobility on the part of this important link of the medical-epidemiological service. The specialized anti-epidemic brigades (SAEB), staffed by highly qualified specialists and provided with the essential required equipment that are now located in a number of anti-plague institutions, within in a period of five to six years may be organized in an any new breeding ground of particularly dangerous infections. Examples of such undertakings are the selfless action taken by SAEB associates during the cholera epidemic difficulties in the 1970's and in the areas of the Armenian earthquake in 1988 - 1989.

Measures to control zoonoses can be made more effective only if there is close cooperation between the various interested departments and institutions, especially between the veterinary and medical science institutions and practitioners. This kind of cooperation will provide for a more effective utilization of funds, personnel, and equipment, and what is particularly important, the exchange of information about animal and human diseases. Such cooperation will also be conducive to the coordination of efforts undertaken in anti-epidemic and anti-epizootological operations.

The morbidity rate of human brucellosis is still considerable, in spite of the efforts undertaken to reduce that rate. This reflects the unsatisfactory epizootological situation in the country.

The highest brucellosis morbidity rate in the USSR is in the Kazakh SSR where it accounts for more than 40 percent of all ill persons. As a rule, human infection occurs during the care and maintenance of animals in the course of lambing, shearing sheep, and cleaning of livestock buildings at defectively maintained farms. Violations of anti-brucellosis procedures have been detected at reprocessing enterprises. According to data from the medical-epidemiological service of the republic, anti-brucellosis rules have been violated at 48.9 percent of the farms and at 24.5 percent of the enterprises that had been investigated.

According to the data obtained from an investigation of human brucellosis infections, up to 50 percent of the afflicted persons were infected by animals of private farms. The control of cattle diseases at private farms is complicated by the absence of a complete inventory of this category of animals. Sporadic brucellosis infections are recorded primarily although group infections also take place. Thus, 97 persons were afflicted in the Moldavian SSR in 1978. The source of the infection was found to be brucellosis-infected cattle brought from Uzbekistan and Turkmenia. In February, 1983 24 persons became ill in the Buryat ASSR. In 1986 43 persons were afflicted at the sovkhoz im. Frunze in the Talgarskiy Rayon of the Alma-Ata Oblast of the Kazakh SSR, and in the same year 30 persons were infected in the Talky-Kurganskiy Rayon in the village Karabulak.

Group morbidity of leptospirosis continues to be recorded in the country. In 1983 an outbreak was recorded in the Orenburg Oblast that affected 394 persons. In 1988 two major nidal areas were recorded: one in Perm (48 persons infected) and the other in the Taldy-Kurgan Oblast of the Kazakh SSR (68 persons).

In spite of the anti-epidemic measures undertaken by the public health and veterinary science authorities, the rate at which Siberian morbidity was being reduced has slowed. Group cases of this infection continue to be recorded.

The leading role played by animals at private farms as a source of human infection (70 percent) is creating significant difficulties in the prevention of human illnesses. The incomplete recording and inclusion of animals from private farms for preventive vaccination procedures and the homestead slaughter of animals constitute one of the principal reasons for human Siberian ulcer infections.

An analysis of human Siberian morbidity for the last two decades in the USSR indicates that it has primarily been of an outbreak nature in the qualitative sense since only about 65 percent of the cases were represented by group infections, i.e., associated with a common source of infection. Thus, in 1973 the largest outbreak took place in the Severnyy sovkhoz of Pavlodar Oblast of the Kazakh SSR where one of the ten afflicted persons died. In 1976 there were 13 outbreaks in six union republics. Furthermore, five of the 37 infected persons in the Turkmen SSR died, and nine of the 37 afflicted person in Karakalpakia succumbed to the disease. In 1979 there was an outbreak in Sverdlovsk involving 96 persons. In 1984 13 persons were infected in one of the kolkhozes in the Dzhambul Oblast of the Kazakh SSR, and in 1986 a

group infection involving 14 persons was recorded in the Pushkinskiy Rayon of the Azerbaijan SSR. In 1988 23 persons became ill in the Degtyan sovkhoz of the Sosnovskiy Rayon of Tambov Oblast, and 14 persons were infected in the village Gaurdak of the Turkmen SSR.

The sources of infections in the nidal areas involving group illnesses were established in 100 percent of the cases. The reason for the outbreaks in a number of cases was the public sale of meat from forcibly slaughtered animals without a veterinary certification.

Among the rickettsiosis infections a clearly pronounced zoonotic infection is Q fever which accounted for up to 30 percent of this group's morbidity rate. About 600 persons are infected by this disease every year, and group outbreaks have been recorded. Thus, in 1983 242 persons were afflicted as a result of air-borne infection in the Voronezh Oblast. Down from goats with Q fever was the means of transmission. A similar situation occurred in the Volchikhinskiy Rayon of the Altay Kray where 93 persons were infected.

An analysis of group human infections common to humans and animals demonstrated that as a rule, they are associated with gross violations of veterinary laws and rules.

The activation of natural breeding grounds of hemorrhagic fever and tularemia in a background of unsatisfactory sanitary and anti-epidemic procedures such as the deficient control of rodents, unsatisfactory protection of water wells, and poor immunoprophylactic procedures, results in group illnesses with these infections. The clearest example of this might be the outbreak of tularemia in the Bogdanovskiy Rayon of the Georgian SSR where 277 persons became ill simultaneously as a result of a contaminated local water source.

A rise in the number of persons afflicted with hemorrhagic fever with renal syndrome (HFRS) was noted in the beginning of the 1980's in the RSFSR. Thus, 3,411 cases were recorded in the republic in 1980, 4,532 cases in 1983, and 11,424 cases in 1985. An analysis of the situation showed that the reason for the sharp rise in morbidity was the unsatisfactory application of planned prophylactic measures and the lack of proper coordination between the medical and veterinary services.

Thus, the primary tasks in preventing outbreaks of zoonotic and natural-focal infections include the unfailing fulfillment of anti-epizootic and medical-epidemic control requirements and veterinary-farm measures by farm authorities with the absolute support of local Soviet authorities.

It is essential to note that the vaccination of people in the event of zoonotic infections constitutes only one of the auxiliary measures for affecting the epidemic process. The eradication of the sources of infectious etiological agents by the specific prevention of illnesses among healthy animals and the sanitization (or slaughter) of sick animals plays a leading role in reducing the morbidity rate of animal-borne human infections. Measures for the individual protection of the population must play an important role in the prevention of natural-focal infections along with measures aimed at suppressing the epizootic process in natural breeding grounds in order to make them non-infectious. A real reduction in zoonotic infections can only be accomplished through the realization of the entire complex of measures aimed at reducing animal morbidity.

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Epidemiology of HIV Infection in USSR

907C0689A Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 2, Feb 90 (manuscript received 12 Jun 89) pp 26-29

[Article by V. V. Pokrovskiy, I. Yu. Yeramova, V. P. Arzamastsev, V. A. Nikonova, and G. I. Mozharova, Central Scientific Research Institute of Epidemiology, USSR Ministry of Health, Moscow]

[Text] Human immunodeficiency virus (HIV) infection is now incident on all continents. However, most countries of the world have recorded only cases of the advanced acquired immunodeficiency syndrome (AIDS) that is marked by a special clinical picture. This kind of epidemiological surveillance not only makes it difficult to evaluate the true incidence of infection, but also makes it impossible to undertake early anti-epidemic measures. A program for the active identification of HIV-infected persons and a system for their compulsory registration have been in effect in the USSR since September 1985. Since January 1988 comprehensive records have been kept at a special scientific research laboratory on AIDS epidemiology and prevention of the USSR Ministry of Health Central Scientific Research Institute of Epidemiology on data concerning all research undertaken and all persons identified with HIV antibodies.

Materials and Methods

Data on monthly investigations are transmitted in writing or by telegraph employing a specially designed form of statistical reporting.

Information was received from a total of 338 institutions between January 1988 and March 1989. These included 182 blood transfusion stations, 16 epidemiological-medical stations, 74 clinical hospitals, 11 infection hospitals, 15 skin and venereal diseases clinics, 30 scientific research institutes, five anti-plague stations, and from five other institutions.

The data received were processed by a specially designed automated system for processing data on testing the USSR populace for HIV antibodies.

Table 1. Frequency of HIV-Infection and AIDS Identification in the USSR, 1985-1989

Index	1985	1986	1987	1988	1989 (Jan-Apr)	Total
Number of persons with HIV antibodies:						
Soviet citizens	0	0	31	81	86	198
Foreigners	4	52	54	275	34	415
Number of AIDS patients:						
Soviet citizens	0	0	1	3	5	9
Foreigners	1	2	0	0	0	3

Table 2. Results of Testing USSR Populace for HIV Antibodies from Jan 1, 1988 through Mar 31, 1989

Contingent	Number of persons tested	Number of persons with HIV antibodies (enzyme-linked assay)		Number of persons with HIV antibodies (Western blot)	
		total	%	total	%
Soviet citizens	24,378,551	5115	0.02	159	0.0007
Persons identified during an epidemiological investigation	3577	128	3.58	100	2.79
Drug addicts	170,934	40	0.02	0	0
Homo- and bisexuals	23,718	14	0.06	2	0.00843
Persons with venereal diseases	531,432	245	0.05	17	0.00320
Persons engaged in promiscuous sexual relationships	241,429	70	0.03	0	0.000
Persons spending more than one month abroad	210,873	38	0.02	3	0.00142
Blood donors	14,397,953	2210	0.02	7	0.00005
Pregnant women	6,110,864	1303	0.02	8	0.00013
Recipients of blood preparations	65,169	54	0.08	0	0
Military service personnel	68,087	28	0.04	0	0
Prison inmates	447,873	66	0.01	0	0
Persons examined by clinical indications	902,731	629	0.07	7	0.000775
Persons tested anonymously	36,237	38	0.10	1	0.00276
Persons who had daily medical contact with AIDS patients or HIV-infected individuals	21,028	6	0.029	0	0
Miscellaneous	1,146,646	273	0.02	14	0.00122

Persons with HIV antibodies were given a special questionnaire in order to identify the risk factors of infection and infected contact persons.

Results and Discussion

Table 1 presents data on persons identified with HIV antibodies and AIDS patients in the USSR during the period of 1985 to 1989. In 1989 the number of infected Soviet persons increased in comparison to infected foreigners as compared to 1985. The total data picture on an examination of the native population of the USSR in 1988 is given in Table 2. In addition, 275 HIV-infected foreigners were identified during that period. All of those persons were examined in connection with the fact that they had arrived in the USSR for a stay of more than three months.

The results of the Soviet citizen examination show that HIV infections were encountered rarely in 1988. This is

convincingly indicated by the extremely low indices for blood donor and pregnant women infection rates.

At the same time the incidence of infected persons among the risk groups such as homosexuals and venereal disease patients exceeded the average figure for the entire population by 13 and 5 times, respectively. The identification of infected persons by clinical indications has been effective (119 times higher than a general indicator). The absence of infected persons among drug addicts cannot be fully explained. Apparently, few of the addicts who were examined had been injecting drugs intravenously or this method of drug administration is relatively rare in the USSR. However, it is also possible that the virus has yet not reached into the drug addict population in the USSR. The risk of infection among those who spent more than three months abroad is also somewhat elevated.

Table 3. Incidence of HIV-Infected Citizens of the USSR Identified by Risk Factors as of April 12, 1989

Basic risk factor	Number of infected persons		
	total	male	female
Homosexual relations:			
total	45	45	0
with Soviets and foreigners	8	8	0
with Soviets only	37	37	0
Heterosexual relations:			
total	54	18	36
with HIV-infected foreigners	6	0	6
with HIV-infected Soviets	15	7	8
with unknown foreigners	22	3	19
with unknown Soviets	11	8	3
Transfusion of infected blood	11	6	5
Infection by repeated use of unsterilized medical instrument	51	26	25
Transmission of infection from mother to child:			
total	10	4	6
during pregnancy and par turition	9	3	6
during breast feeding	1	1	0
Transmission of infection from child to mother during breast feeding	7	0	7
Visit to Africa	4	4	0
No data available	16	7	9
Total	198	110	88

The most effective method for identifying infected persons was the epidemiological investigation of identified HIV-infection cases which enabled the identification of 100 out of 159 infected persons (62.9 percent). The most instructive episode demonstrating the effectiveness of combining epidemiological surveillance with epidemiological investigation was the disclosure of an intrahospital HIV-infection outbreak in the city of Elista. This enabled us to establish a connection between two independent cases of discovered HIV-infections as reported in the special scientific research laboratory on AIDS epidemiology and prevention (this epidemiological investigation will be published in a separate report).

The results of the epidemiological investigation of HIV-infection cases identified as of April 1989 in the USSR are given in Table 3. Heterosexual transmission of HIV was shown to be the predominant means of transmission in the USSR (27.3 percent of the infection cases) both from men to women (66.7 percent) as well as women to men (33.3 percent). A significant proportion of infections was during the administration of parenteral procedures (25.8 percent) and viral transmission among homosexuals was only in third place (22.7 percent).

There were no recorded cases of HIV transmission via blood transfusions in 1988 (see Table 1). All 11 cases (5.7 percent) occurred in previous years. The large number of women infected via the heterosexual route accounts for the relatively large percentage (5.2 percent) of infected children born to those women.

The data demonstrate that the true risk factors for most infected persons are still the unknown persons and these individuals are not subject to compulsory observation. In that connection, although the epidemiological surveillance system now existing in the USSR can be considered sufficiently effective, one should not think that the transmission of the virus among the population can be completely arrested by identifying the infection sources. It is rather difficult to determine the accuracy with which

the current epidemiological surveillance system characterizes the incidence of HIV-infections among USSR citizens. It is not clear how many blood donors and persons from other groups were examined repeatedly (donors are examined before each donation of blood). Since the persons identified during an epidemiological investigation cannot be counted in estimating the infection rate for the whole population, the actual number of infected persons in 1988 in the USSR where there are 285 million inhabitants, could range from 700 to 2,000 by the beginning of 1989. In that case one should also take into consideration the fact that all of the sexually transmitted HIV-infection cases occurred in the major cities (Moscow, Leningrad, Odessa, Minsk, and Kiev) and that there were no recorded cases in three out of the four Central Asian republics, in Georgia, Azerbaijan, and in Russia beyond the Urals.

In spite of the rather low incidence of HIV-infections in the USSR, one can already say that there is the beginning of an epidemic which could take on menacing proportions within a few years without a combined anti-epidemic and prophylactic effort that particularly instructs the public in safe sexual behavior.

Conclusions

1. The beginning of HIV-infection prevalence among the USSR population has been noted.

2. In 1988 HIV-infections were predominantly incurred via heterosexual and parenteral routes.

UDC 633.31:576.851.155

Isolation of Recombinant Transducing Phages of Rhizobium Meliloti With Broad Host Range

907C0628A Moscow GENETIKA in Russian Vol 26 No 1, Jan 90 (manuscript received 10 Aug 88; after revision 28 Dec 88) pp 37-42

[Article by N. I. Novikova, V. I. Safronova, Ye. K. Lyudvikova, and B. V. Simarov, All-Union Scientific Research Institute of Agricultural Microbiology, Leningrad]

[Abstract] Mutants of strains 425a and L5-30 and bacteriophages Rm1, Rm3, Rm120, Rm134 and ΦM12 of Rhizobium meliloti were used to isolate recombinant transducing phages with a broad host range and high frequency of transduction. The appearance of plaques on the LSKhM1 lawn indicated recombination between Rm1 and Rm3, and it was shown that phages with a greater number of infections had higher recombination frequencies. Five hybrids of Rm1xRm134 (P10, P14, and P15) and Rm1xRm120 (P19 and P20) transferred genetic material with a 10^{-4} to 10^{-6} frequency. Analysis of 80 rifampicin- resistant transductants induced by phage P19 showed that rifampicin- and streptomycin-resistance were linked and demonstrated high frequencies of joint transfer in L5-30 mutants. These recombinants are suitable for use in genetic selection research in tuberculate bacteria of Medicago. Figures 1, tables 5, references 13: 7 Russian, 6 Western.

UDC 575.1:581.17:581.154

In Vitro Selection of Cytoplasmic Mutants in Potatoes

907C0628B Moscow GENETIKA in Russian Vol 26 No 1, Jan 90 (manuscript received 18 Apr 88; after revision 7 Jul 88) pp 84-90

[Article by V. A. Sidorov, V. M. Samoylov, V. L. Dubinich, Institute of Botany imeni N. G. Kholodniy, Ukrainian Soviet Socialist Republic Academy of Sciences]

[Abstract] Chlorophyll-deficient and streptomycin-resistant cytoplasmic mutants in eight varieties of potato plants were isolated to further work on hybridization. The simple and effective technique used consisted of isolation of chimeric scions selected in the first vegetative progeny by means of microclonal propagation in plants cultivated in vitro. The plants were treated with the mutagen nitrosomethylurea and streptomycin sulfate to isolate streptomycin- resistant varieties. The frequency of poecilophyllous (variegated- leaved) chimera was 53.7 percent in Lasunok and 43.5 in Vyarba, while at the lower end of the scale it was 10.3 percent in Belorusskiy and 15.6 percent in Belorusskiy Ranniy. Complementation analysis by protoplast fusion was used as proof of the cytoplasmic nature of the mutations. The high frequency of cytoplasmic mutations is due to the specific effect of nitrosomethylurea on the cytoplasm. Figures 1; tables 1; references 16: 7 Russian, 9 Western.

UDC 612.11

Effects of Immune Response Modifier Glycoprotein A on Blood System

907C0533A Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 2, Feb 90 (manuscript received 13 Sep 89) pp 68-71

[Article by A. A. Kamradze, D. I. Eze, Z. E. Petrinya, V. R. Nikolayeva and I. O. Muyzhniyeks, Latvian Order of the Red Banner of Labor State University imeni P. Stuchka]

[Abstract] Trials were conducted on rabbits and mice to assess the pharmacodynamic spectrum of glycoprotein A, an immunomodulator isolated from Penicillium sp., particularly with respect to its effect on the thymus and spleen, number of blood cells, and pyrogenicity. Studies with various means of administration to rabbits and CBA and C57Bl mice revealed that glycoprotein A induced short-term leukocytosis with a shift to the left, concomitantly decreasing the number of nucleated thymic and splenic cells. Nevertheless, thymic and splenic indices were not affected. In addition, a short-term (6 h) febrile response was also noted, which peaked between 1.5 to 3 h after administration. The data demonstrated that glycoprotein A induced changes that are analogous to those that have been observed with other biological response modifiers. Figures 3; tables 2; references 5: 3 Russian, 2 Western.

UDC 615.339:578.245].012

Preparation of Purified, Concentrated Human Interferon from Namalwa Cells

907C0550H Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 6, Nov-Dec 89 (manuscript received 12 Dec 88) pp 711-714

[Article by N. L. Melnikova, N. R. Shukhmina, E. R. Pille, V. V. Zverev, L. V. Isayevich, T. I. Kuzmina, A. I. Shchipanova, Yu. F. Maychuk and O. G. Andzhaparidze, Scientific Research Institute of Viral Preparations, USSR Academy of Medical Sciences; Moscow Scientific Research Institute of Eye Diseases imeni Helmholtz]

[Abstract] Previously described techniques were employed for the preparation and concentration of human interferon from Namalwa cells [Shukhmina, N. R., et al., Molekul. Genetika, No 6: 30, 1984; Cantell, K., et al., J. Gen. Virol., 39: 541, 1978]. In the final analysis interferon was obtained with an activity of 10^5 to 10^6 IU/ml and a specific activity of $1 \cdot 10^6$-$3 \cdot 10^6$ IU/mg of protein. A 500-fold concentration resulted in a 1000-fold increase in specific activity and a 3000- to 5000-fold reduction in the protein content. The average yield of interferon was about 33 percent. Testing against tick-borne encephalitis in a variety of cell cultures showed that interferon activity was concentrated in the 15 and 23 kD fractions identified by polyacrylamide gel electrophoresis. Toxicity trials involving rabbit conjunctival tests, tissue cultures, and suckling hamsters demonstrated the preparation to be nontoxic and suitable for clinical trials. Figures 2; tables 1; references 16: 3 Russian, 13 Western.

UDC 615.275.4.015.4:612.017.1].076.9

Interferon Induction by Immune Response Modifiers

907C0550I Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 6, Nov-Dec 89 (manuscript received 4 Apr 88) pp 717-720

[Article by E. B. Tazulakhova, N. N. Amitina, G. M. Ignatyev, F. I. Yershov, Yu. B.Maurinsh and M. Yu. Lidak, Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] A comparative study was conducted on interferon induction by the immune response modifier inosiplex [sic] and its derivative, ASK, in 12-14 g male CBA mice, in conjunction with natural (phage f2 dsRNA) and synthetic inducers (poly-G:C). Maximum serum levels of 250 U were obtained when inosiplex was administered in a dose of 25 mg/mouse 4 h before 100 μg/mouse of poly-G:C, with interferon persisting at that level for 3 days. Even longer persistence of similar serum interferon concentrations were obtained with ASK. In the latter case high interferon titers persisted for 7 days when 25 mg/mouse of ASK was administered 4 h before 50 μg/mouse of poly-G:C. Figures 5; references 16: 6 Russian, 10 Western.

UDC 615.849.19.015.4.076.9

Susceptibility of Animals to CO_2 Laser Radiation

907C0510H Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 10 Nov 88) pp 45-47

[Article by I.N. Ushkova, L.A. Pokrovskaya, L.P. Rodionova, G.N. Kuzminskaya, L.L. Goncharova, I.N. Makarova, N.Yu. Malkova and G.N. Sergeyeva, Scientific Research Institute of Labor Hygiene and Occupational Diseases; Sanitary Hygienic Medical Institute, Leningrad]

[Abstract] Male chinchilla rabbits were utilized for further assessment of the biological effects of CO_2 lasers (10.6 μm wavelength) currently finding wide medical acceptance. The trials were conducted with LGN-703 laser, employing a corneal threshold dose (21 J/cm^2, 71 sec, 2.5 cm diameter coverage) and a dose equivalent to 1/7th of the threshold dose. Monitoring of the animals for 30 days after the threshold dose revealed irreversible corneal changes and hypertension, cardiac and hepatic hyperemia, reduction in reticulocytes at days 5 and 10, and recovery of reticulocyte counts by day 30. In addition, blood chemistries indicated depletion of antioxidative mechanisms. The subthreshold dose induced corneal damage in 50 percent of the rabbits, hypotension, and other analogous but less pronounced changes seen with the higher dose. The basic mechanism of action of the laser was attributed to thermal effects on the nerve endings in the cornea, resulting in systemic alterations via the central nervous system. Tables 2; references 3 (Russian).

UDC 591.513.5:599.537

Ability of Bottle-Nosed Dolphins To Generalize by Relative Sign

907C0624A Moscow ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI IMENI I. P. PAVLOVA in Russian Vol 40 No 1, Jan-Feb 90 (manuscript received 4 Jan 89; after revision 13 Sep 89) pp 44-51

[Article by D. A. Fless, Yu. D. Starodubtsev, and Ye. M. Starodubtseva, Chair of Physiology of Higher Nervous Activity, Moscow State University imeni M. V. Lomonosov]

[Abstract] The ability of two female bottle-nosed dolphins (Tursiops truncatus ponticus) to isolate and generalize according to a spatial relative sign was studied. The dolphins were tested for the ability to orient themselves by the relative position (right-left) of two identical objects, one of which was an irritant, and remember the signal significance of the relative sign in changing conditions, and for the ability to abstract, isolate, and generalize the sign of any other pair of objects in the same spatial arrangement without new training. In the second stage of experiments, the initial objects were replaced by others differing from the former in their shape, size, material, etc. The dolphins were able to differentiate as a signal the relative spatial sign "right-left" in changing conditions, indicating that they have a high level of integrative brain activity. They also manifested the maximum degree of abstraction and generalization thought possible by an animal: the ability to choose between two objects "to the right and to the left in general". Figures 2; references 20: 19 Russian, 1 Western.

UDC 615.477.8:615.281.03].07

Sanitary-Chemical Study of Polyvinylstyrene Antimicrobial Films

907c0279b Moscow
KHIMIKO-FARMATSEVTICHESKIY ZHURNAL
in Russian Vol 23 No 8, Aug 89 pp 979-982

[Article by Z. K. Baykova, L. I. Petrova, V. Ya. Bogomolnyy, Okhtinsk "Plastpolimer" Scientific-Production Association, Leningrad]

[Abstract] Viniplen, a polymer film made from polyvinyl alcohol and used to treat donor sites in skin transplant operations, has been found quite effective as a film for protection of wounds and burns. It meets the requirements of limited swelling and solubility in water. This article studies PVS films containing dioxidin and catapol, to determine their suitability for medical use. The main criteria used in the study were the content of substances used or formed in their manufacture in extracts from the films, such as vinyl acetate, acetic acid and ethanol, which could have biological effects. The films were found to have satisfactory sanitary-chemical properties similar to Viniplen, which does not contain the antimicrobial substances.

UDC 616.594.14-02:615.2/.3

Toxic Alopecia in Chernovtsy

907C0607A Kiev VRACHEBNOYE DELO in Russian
No 1, Jan 90 (manuscript received 24 Jan 89)
pp 102-104

[Article by L. D. Kalyuzhnaya, L. A. Dereveyanko, and O. V. Snitsarenko, Department of Pediatric Dermatovenerology (Head - Docent L. D. Kalyuzhnaya), Kiev Institute for the Advanced Training of Physicians]

[Text] Hypotrichoses are classified into congenital (hereditary ectodermal dysplasias, structural hair alteration such as monilethrix, trichoclasia, etc.) and acquired types. The more frequently encountered forms are acquired hypotrichoses which are in turn divided into cicatricial (scleroderma, Brock's pseudoalopecia, discoid lupus erythematosus, atrophic lichen planus, mucinous alopecia, scalp traumas) and non-cicatricial forms. Among the non-citracicial alopecias, one should distinguish the symptomatic alopecias, alopecia areata as well as often encountered trichotillomania, children's inclination to hair-pulling. Alopecia areata is the most prevalent form of alopecia and is found in 5 to 15 percent of children. Symptomatic alopecia may be a sign of various kinds of intoxication (severe infectious diseases, poisoning by heavy metal salts, ingestion of drugs such as anticoagulants, cytostatics, borates, thyreostatics, cholesterol-reducing preparations, and hypervitaminosis A).

During August through November 1988, there were cases of diffuse alopecia in children whose onset occurred within one to three days. As a rule, the role of chemical substances in alopecia has been underestimated. At the same time, the possible effect of chemical substances should always be considered to be a probable reason for inexplicable hair loss. Mercury, thallium, boron, and bismuth poisonings are most frequently the cause of symptomatic hair loss.

Mercury poisoning occurs accidentally in the course of everyday activities or through the use of cosmetics. For example, some bleaching creams contain mercury and when they are applied to the skin there can be significant transcutaneous absorption resulting in diffuse hair loss that can be accompanied by such systemic symptoms as weight loss and excitability. In afflicted children, usually aged from six months to two years, the condition begins with an inexplicable fever, excitability, and hypotony. The palms, feet, and nose swell, redden, and soon after begin to peel. There is profuse perspiration and hair loss which can become pronounced. Finger and toenails may also be shed [2]. The mercury level in the urine can be used to establish a proper diagnosis.

Salts of thallium are used in rodent control, in the manufacture of luminescent compounds, and can be used to increase the octane number of gasoline. Thallium compounds that enter the body through the small intestine, the respiratory pathway or through the skin rapidly accumulate in the muscles, liver, small intestine, and at a rather slow rate (over a period of three to sixteen weeks) in the hair. Thallium attacks the central nervous system, the digestive tract, and kidneys, and causes hair loss. A toxic dose of thallium is 8 mg/kg. Symptoms of such poisoning include polyneuritis with hyperalgesias, convulsions, insomnia, disturbance of the digestive tract, psychic disturbances, cataracts, inflammation of the iris, scotoma, and loss of vision.

Thallium salts have been used to control profuse perspiration in tuberculosis patients in which case the depilatory action of the compounds has been manifested. The salts have also been used in the treatment of trichomycosis, either as an external plaster or administered orally. Following total baldness, hair again begins to grow in the pilose areas of the head [1]. In animal experiments alopecia started two to three weeks after the ingestion of thallium. Signs of thallium poisoning include nausea, vomiting, lassitude, ataxia, tremors, alopecia, fatigue, and pain in the feet. When small doses of thallium are present alopecia may be a diagnostic symptom regardless of whether it is combined with other manifestations.

Boron compounds may frequently enter a body accidentally such as during the intensive application of patented agents for mouth washes. There have been descriptions of alopecia resulting from the vocational contact with sodium boride. Alopecia develops gradually in boron poisoning and is diffuse in nature.

Bismuth preparations that are used in the treatment of syphilis are believed to induce diffuse alopecia. Therefore, in October, when two to six children were afflicted

every day, on the basis of an analysis of the case histories and the clinical picture we presumed the children were poisoned by an active chemical agent.

At the end of October the children were hospitalized at pediatric clinics in Moscow and Kiev. Toxic alopecia was identified in 132 children. Eighty-three children who came from Chernovtsy to the Kiev Scientific Research Institute of Pediatrics, Obstetrics and Gynecology were under our observation. Large groups of the patients were hospitalized from October 26 to November 25. We had the impression that the morbidity was not decreasing. However, upon examining the children and questioning the parents, we found out that the number of children with the hair diseases who were being brought to the clinics abruptly increased as the alarm of the city's residents became greater. Among the admitted children were 18 with various forms of alopecia areata, two with trichotillomania, and one without any hair loss (fear on the part of the mother).

Sixty of the admitted patients were diagnosed as suffering from toxic diffuse alopecia. A little girl who was brought into the clinic on November 25 had lost her hair on October 20 but her grandmother did not take her to the doctor. There were many more cases where children were not taken to a physician until five to fourteen days after losing their hair. This led us to doubt the analysis of the morbidity rate that was compiled on the basis of the frequency of visits to physicians. The medical history and clinical picture had characteristic features in toxic alopecia. In children the hair was loss was intensive on the pilose part of the scalp. Upon touching the hairs they could easily be removed from the follicles. Over a period of one to three days the long hairs fell out completely. Therefore, the morbidity rate had to analyzed within precise periods of hair loss, and not by the frequency of visits to physicians. Our analysis allowed us to conclude that the last case of toxic alopecia was recorded on November 14, and not on December 1, was recorded in the reports.

The clinical picture was the same for all of the 60 afflicted children aged three months to 10 years for whom the presumed diagnosis was toxic alopecia. The overall health of the patients was not impaired. The pilose portion of the scalp was devoid of long hairs while lanugo was retained on the trunk and head. Bristly hairs did not fall out. Fine hairs 0.5 - 3 cm in length were retained on the border of the pilose region of the scalp and around the temples in all of the patients. Some of the patients exhibited leukonychia. Upon a close examination of the hair that remained after an injection of unithiol, we could see black inclusions which appeared under the microscope to be flask-shaped or spindle-like in form that were located on hair shoots at a distance of one to five millimeters from the skin surface. When the hairs were pulled they easily broke off at the level of the darkened areas. When the hair was tested for thallium content in order to confirm the diagnosis of thallium alopecia, the results were negative inasmuch as the tests were made on the hairs that had fallen out on the first day and on the cut free edge of the nail plates. Therefore, much depended upon the correct selection of materials for study. Following a careful depilation procedure, thallium was detected by the atomic absorption method on November 8 in an eight-year old male patient who was admitted the clinic on October 26, 1988. Following the first positive reaction by the epilatory method, examination material was taken from children with initial growth of hair as well as shavings of nail plates in the growth region of children in whom hair loss had begun two months ago.

In order to establish the degree of intoxication the children were seen by a pediatrician, a gastroenterologist, an allergist, an otorhinologist, a stomatologist, a neuropathologist, a psychiatrist, a toxicologist, an infectious disease specialist, and endocrinologist. A detailed study was made of immune status, hemograms, and kidney function. Remote thermography, electroencephalography, rheoencephalography and ultrasonic examination of the liver and pancreas were undertaken as well as the measurement of daily catecholamine excretion and blood thyrotropic hormone. The results of these tests indicated a few cases of cholecystoangiocholitis, reactive hepatitis, gastroduodenitis, bronchitis, and eosinophilia. Hallucinations were short-term in three children with childbirth trauma or encephalopathy. The amount of thallium that entered the body could be considered so insignificant that alopecia turned out to be the first and only symptom of the disease. In the case of negative findings (absence of thallium in the hair), poisoning was induced by another active chemical agent (possibly boron or its compounds). If the patient was given unithiol two days after the onset of hair loss, a small amount of hair was retained. This indicates that heavy metal salts were the cause of alopecia.

The patients received the following treatment at the clinic: methionine (which elevates the blood level of cystine and facilitates the removal of a chemical agent), geroton, phytin with calcium glycerophosphate, essential oil, ATP, aloe, massage of the pilose region of the scalp, external application of naphthalane alcohol, and Kenalog. Two to three weeks after the hair loss, the hair spontaneously was restored, which is also typical of thallium alopecia.

The considerable number of patients with alopecia areata who were admitted to the clinic and subsequent calls for consultation to other cities of the Ukraine necessitated a study of this pathology. Alopecia areata can begin at any age. One or several initiating areas about the size of a five-kopeck coin appear on the pilose part of the scalp. The skin in the initial affected area is not altered, but is pale and around the skin is a "zone of loosened hair" up to 1 cm wide. The foci grow around the periphery and converge among themselves. Spontaneous regression can take place in 45 percent of the children. In severe cases the disease progresses and becomes total. When long hairs are absent, the lanugo, eyebrows and eyelashes fall out and sometimes onychodystrophy follows. The disease may be associated with

chronic foci of focal infection that are frequently tonsillogenic an odontogenic, helminthic invasion, and endocrinopathies. The disease may also follow stress, emotional experiences, and severe influenza. A neurotrophic version of primarily hypothalamic syndrome is observed in the case of total alopecia. Therefore, such patients should be examined for enterobiasis and toxoplasmosis, and should be seen by an otorhinologist, stomatologist, psychoneurologist, and endocrinologist. In the case of helminth poisoning, the foci could be small, up to 1 - 15 kopeck coin, resembling "moth-eaten fur" in syphilis cases. In addition, children may also exhibit trichotillomania where a child, involuntarily, without a pen or pencil in hand, twists hair around his finger and pulls the hair and pulls or breaks off eyebrow or eyelash hairs. The thinning sections of hair can reach considerable dimensions. In the course of establishing a diagnosis attention should be given to the characteristics of the course (rate of hair loss) and clinical aspects (absence of long hairs only) of toxic alopecia. Only a dermatologist should establish the final diagnosis in any case of alopecia.

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UDC 582.282.123.2:620.193.8

Probability Nature of Conidia *Aspergillus Niger* Adhesion to Polymer Surfaces

907C0385B Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 51 No 5, Sep-Oct 89 pp 39-44

[Article by I. V. Kaznacheyev, K. Z. Gumargaliyeva, Yu. V. Moiseyev and S. N. Mironova; Institute of Chemical Physics, USSR Academy of Sciences, Moscow, Institute of Microbiology, BSSR Academy of Sciences, Minsk]

[Abstract] A study of the probability nature of adhesion of the microscopic fungus *Aspergillus Niger var. Tiegh* to polymer surfaces involved growing *A. niger* on a Chapek medium at 30 degrees C for 14 days, producing a suspension by washing in distilled water, collecting on membrane filters and drying at room temperature. Polymer materials of different degrees of hydrophilicity (polyethylene and cellophane) served as a base to which a conidia suspension (titer 10^6/ml was applied by a microdoser. Samples were centrifuged at different angular velocities of rotation of the centrifuge and the number of adherences was counted. Adhesion of *A. niger* had a probabilistic nature because of the size heterogeneity of the conidia and the heterogeneity of the polymer bases. The distribution of conidia according to forces of adhesion followed a Gaussian pattern. The quantitative nature of the process of interaction of the microscopic fungi and the solid polymer surfaces may serve as a criterion of microdestruction of materials. Figures 7: references 7 (Russian).

UDC 579.881.11

Biological Properties of Bernet Rickettsia Isolated in the Northwest of the UkSSR

907C0385C Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 51 No 5, Sep-Oct 89 pp 60-67

[Article by N. D. Klimchuk and Z. G. Kushnir; Scientific Research Institute of Epidemiology and Microbiology, Lvov]

[Abstract] A 1987 study of Q fever in the Northwest of the UkSSR (Volyn Oblast and Rovno Oblast) in natural foci of this disease revealed 2 strains of Bernet rickettsia. Strain "Politsky" was isolated from the common vole near the village of Politsy in Vladimiretskiy Rayon, Rovno Oblast and strain "Gishin" was found in ixodid ticks in the village of Gishin in Kovelskiy Rayon, Volyn Oblast. Study of the biological properties of these strains of the Q fever pathogen, found for the first time in this region, showed that strain "Gishin" was highly virulent for guinea pigs and white mice while strain "Politskiy" was much less virulent in this respect. Corpuscular antigen of phase I, prepared from rickettsia strain "Politskiy" was highly active in revealing the corresponding antibodies in blood sera of laboratory animals which made it possible, later, to use it to diagnose Q fever in humans. The highly-sensitive indirect immunofluorescence reaction indicated the possibility of determining antibodies to phase I of the pathogen by the 17th day after infection. The presence of the Q fever pathogen with different degrees of virulence confirmed the necessity of sound diagnosis and isolation of Q fever patients among persons with febrile diseases. Circulation of the "Politskiy" strain, with lesser virulence, requires etiological interpretation of Q fever among persons with flaccid, subclinical diseases, especially cardio-vascular disease, liver disease and pathologies of pregnancy. Figures 2; references 18: 16 Russian; 2 Western.

UDC 579.264

Effect of *Aerococcus Viridans*, Bases of New Therapeutic-Prophylactic Drug "M-Bacterin", on Biological Properties of *Staphylococcus Aureus*

907C0385D Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 51 No 5, Sep-Oct 89 77-81

[Article by M. L. Gorbunova, Ye. I. Lobanova, T. Ye. Drozd et al.; Dnepropetrovsk Medical Institute]

[Abstract] The collective of the chair of Microbiology of Dnepropetrovsk Medical Institute has developed a new therapeutic-prophylactic drug "M-bacterin" from a live lyophilized culture of bacteria-antagonists *Aerococcus viridans* No. 17. Studies on experimental models have shown the antagonistic effect of aerococci on pathogenic staphylococci. The Committee of Vaccines and Sera at the USSR Ministry of Health demonstrated the harmlessness and effectiveness of "M-bacterin" in treatment of acute purulent diseases of the skin and mucous membrane of the mouth which are predominantly of staphylococcal etiology. The aerococci had an antagonistic effect on staphylococci in a wound, demonstrated by the significant reduction of the number of pathogens in the secretion from the wound. This study of the mechanism of antagonistic action of aerococci in relation to *Staphylococcus aureus* showed that combined cultivation of staphylococcus and aerococci in meat peptone broth produced a progressive decrease in the number of viable staphylococcus cells with each passage with survival of only individual cells after the 7th passage and death of all cells after the 8th passage. Stapphylococcus clones, subjected to the effect of *Aerococcus viridan* No 167 in vitro and in vivo, formed small colonies with slight pigmentation in comparison with the control. Electronograms indicated deep changes in the cell ultrastructure. Changes in the ultrastructure increased as a function of the duration of contact of the staphylococci with the antagonists in vivo and in vitro. The study revealed the anti-staphylococcal action of *Aerococcus viridans* No 167 upon which is based the new drug "M"-bacterin. Figures 3; references 11: 9 Russian; 2 Western.

UDC 579.841.017.7

Accumulation of Poly-B-Hydroxybutyric Acid by Some Oligotrophic Polyprosthecate Bacteria

907C0544B Moscow MIKROBIOLOGIYA in Russian Vol 58 No 6, Nov-Dec 89 (manuscript received 6 Apr 88) pp 923-926

[Article by A. M. Semenov, A. Ganzlikova, and N. Tenov, Institute of Microbiology, USSR Academy of Sciences, Moscow; Institute of Microbiology, Czechoslovak Academy of Sciences, Prague]

[Abstract] In view of the growing importance of poly-B-hydroxybutyric acid (PBHBA)-based biodegradable materials, the polyprosthetic bacteria Labrys, Prosthecomicrobium, and Stella were assessed for accumulation of PBHBA and potential use in the control of environmental pollution. The study demonstrated that S. humosa, P. pneumaticum and S. vacuolata accumulated PBHBA to levels equivalent to 36, 38, and 28 percent, respectively, of their dry weight, a process that was essentially independent of their growth stage. Accumulation was growth-stage dependent in the case of L. monachus and P. hirschii, with total accumulations of, respectively, 25.8 and 23.1 percent occurring largely in the stationary phase. In the final analysis, these findings demonstrate that the bacteria in question may have promise in the treatment of nontoxic effluents, and may have greater utility when employed in mixed cultures. Figures 2; references 9: 5 Russian, 4 Western.

UDC 579.8.017.7:550.72

Microbial Leaching of Bauxite Elements

907C0544C Moscow MIKROBIOLOGIYA in Russian Vol 58 No 6, Nov-Dec 89 (manuscript received 15 Dec 88) pp 956-962

[Article by L. V. Ogurtsova, G. I. Karavayko, Z. A. Avakyan and A. A. Korenevskiy, Institute of Microbiology, USSR Academy of Sciences, Moscow]

[Abstract] Sixty-three microbial strains representing 15 genera were tested for their efficiency in leaching kaolinite-hematite-bemite bauxite components in order to assess their industrial applications. Comparison of the levels of SiO_2, Al_2O_3, and Fe_2O_3 in sterile solutions and those containing the various microorganisms showed that, over an equivalent period of time, mycelial micromycetes increased leaching 9.7- to 165-fold, yeasts 3- to 11-fold, and heterotrophic bacteria 3- to 10-fold. Nitrifying bacteria were ineffective, while Thiobacillus thiooxidans was the sole sulfur bacterium to promote leaching, particularly of aluminum oxide. In general, the mycelial micromycetes and the heterotrophic bacteria were more efficient in silicon and iron recovery, while yeasts promoted aluminum extraction. However, certain yeasts also were efficient in iron extraction. Figures 3; tables 4; references 7: 4 Russian, 3 Western.

UDC 579.841.11.083

Colonization of Fibers by Ethylene Glycol-Degrading Bacteria

907C0544D Moscow MIKROBIOLOGIYA in Russian Vol 58 No 6, Nov-Dec 89 (manuscript received 1 Nov 88) pp 995-999

[Article by N. F. Mogilevich, P. I. Gvozdyak, L. V. Nevinnaya and O. A. Zakordonets, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy and Institute of Botany imeni N. G. Kholodnyy, Ukrainian Soviet Socialist Republic Academy of Sciences, Kiev]

[Abstract] Growth kinetics were compared for the ethylene glycol-degrading Pseudomonas aureofaciens in solution and when colonizing glass and capron fibers. The results demonstrated that under normal conditions of cultivation (pH 8) the growth rate on the fibers was twice as great as in the capron fibers or in liquid-phase cultivation, while under adverse conditions (pH 9) growth occurred only on the glass fibers. In all cases growth was superior on glass fibers in comparison with capron fibers. In the case of the fibers a bacterial monolayer film was formed after 24 h, reaching a biofilm thickness of 0.2-0.5 mm after 12 days. Figures 2; tables 1; references 3: 2 Russian, 1 Western.

UDC 579.843.4.017.7

Physiological and Biochemical Characteristics of Hereditary Variants Arising in *Photobacterium Leiognathi* Population

907C0544E Moscow MIKROBIOLOGIYA in Russian Vol 58 No 6, Nov-Dec 89 (manuscript received 7 Jul 88) pp 1000-1006

[Article by A. N. Shenderov, I. Yu. Videlets, N. I. Lutskaya, V. B. Gurevich and A. V. Svetlakov, Institute of Biophysics, Siberian Division, USSR Academy of Sciences, Krasnoyarsk; Krasnoyarsk State University]

[Abstract] An analysis was conducted on the luminescent system in five spontaneous variants arising in Photobacterium leiognathi 54 with a frequency of 10^{-3} to 10^{-5}. The study demonstrated that the variants differed from the parental wild type and among themselves in terms of colonial morphology, growth requirements, patterns of nitrogen, carbohydrate, and lipid metabolism, glucose repression, and control of gene expression of the luminescent system components. Accordingly, the data indicate that Photobacterium leiognathi possesses several alternative genetic programs for gene expression and metabolic regulation with epigenetically determined switching mechanisms. However, DNA splitting studies using eight restrictases failed to reveal any differences to date, nor have plasmids been implicated in the observed physiological and biochemical differences. Figures 3; tables 1; references 9: 5 Russian, 4 Western.

UDC 579.23:579.842.24

Preparation and Fusion of Erwinia Chrysanthemi Spheroplasts

907C0544F Moscow MIKROBIOLOGIYA in Russian Vol 58 No 6, Nov-Dec 89 (manuscript received 18 Aug 88) pp 1037-1051

[Article by N. A. Troitskiy and K. N. Yakovenko, Institute of Genetics and Cytology, Belorussian Soviet Socialist Republic Academy of Sciences, Minsk]

[Abstract] Studies with Erwinia chrysanthemi ENA-49 VY4951 and VY0206 demonstrated ready induction of spheroplast formation in hypertonic media with 3 percent glycine and a conversion rate of 99 percent. On selective hypertonic media better than 10 percent of the spheroplasts reverted to the rod form. Polyethylene glycol-mediated fusion with a 1:1 mixture of the two spheroplast population in the glycine medium led to the recovery of the two parental strains and five recombinant strains, with phenotypic studies showing that 21.83 percent of the primary clones were represented by hybrids. Figures 2; tables 2; references 8: 3 Russian, 5 Western.

UDC 579.841.11-252.5

Genetic Determination of Degradation of Ampholytic Surfactants

907C0544G Moscow MIKROBIOLOGIYA in Russian Vol 58 No 6, Nov-Dec 89 (manuscript received 27 Sep 88) pp 1043-1044

[Article by L. F. Ovcharov, L. A. Taranova and P. I. Gvozdyak, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Soviet Socialist Republic Academy of Sciences, Kiev]

[Abstract] Studies on the genetic factors underlying the biodegradation of ampholytic surfactants led to the identification of the plasmids pDX4 and pDX5 in Pseudomonas putida 141 and Ps. stutzeri AT. In the former case pDX4 is responsible for the metabolism of alkylamino-bis-propionate and in the latter case pDX5 is responsible for the degradation of amidobetaine. Degradation of cyclimide by Ps. desmolytica C37 is evidently governed by the bacterial chromosome, as is metabolism of ampholytic surfactants by Pseudomonas sp. 1 and Citrobacter freundii TO. Tables 1; references 7: 4 Russian, 3 Western.

UDC 579.68:579.22.547.91

Surfactant Properties of Hydrocarbon-Oxidizing Bacteria

907C0599A Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: BIOLOGIYA in Russian No 1, Jan-Mar 90 (manuscript received 2 Jun 89) pp 14-18

[Article by T. V. Koronelli and S. G. Yuferova]

[Abstract] The advantages of biosurfactants—stability over broad ranges of temperature, pH, salinity, degradation, and nonpollutant character—led to an assessment of the surfactant properties of Rhodoccus maris MST-32, R. erythropolis AR-25, 92A, 94A, 57A, 57AVG, R. luteus 77A, Arthrobacter ceroformans 2F, and Acinetobacter calcoaceticus 6915. Each of the strains in question was demonstrated to produce biosurfactants, either cell-bound or secreted into the culture medium. The cell suspensions, culture fluids, and/or supernatants served as emulsifiers of hydrocarbons in water and precluded the formation of stable water-oil emulsions. In general, biosurfactant efficiency was genera- and species-dependent. However, rhodoccocal surfactant was cell-bound and efficiency was strain- rather than species-dependent. Tables 2; references 9: 5 Russian, 4 Western.

UDC 575.224:582.232

Synechocystis 6803 Cyanobacterium Mutants Resistant to Photosynthesis Inhibitors

907C0599B Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: BIOLOGIYA in Russian No 1, Jan-Mar 90 (manuscript received 10 Oct 88) pp 42-46

[Article by O. A. Koksharova and S. V. Shestakov]

[Abstract] Extensive use of herbicides in agriculture prompted studies on the construction of herbicide-resistant plants via genetic engineering. Herbicide-resistant cyanobacteria may find use as a ready source of genes for such purposes. Accordingly, a series of mutants of Synechocystis 6803 were identified, the photosystem of which was not affected by diuron, dinoseb, or parachloromercuribenzoate. The mutants did not differ from the parental wild type in the photoautotrophic growth rate, oxygen evolution, or carbon dioxide fixation. In addition, DNA derived from the mutants transformed the wild type to diuron, dinoseb, and parachloromercuribenzoate resistance at a low frequency ($0.1 \cdot 10^{-7}$ to $6 \cdot 10^{-7}$) that was, however, higher than the frequency of spontaneous mutations (10^{-8} to 10^{-9}). Figures 1; tables 3; references 14: 4 Russian, 10 Western.

UDC 579.63

Pseudomonas Microorganisms That Degrade Oxypropylated Glycerin

907C0631A Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 52 No 1, Jan-Feb 90 (manuscript received 3 Jan 89) pp 28-32

[Article by O. N. Zambrzhitskiy, M. V. Budris, A. K. Kabashnikov, S. P. Kovalenko, Institute of Microbiology, Belorussian Soviet Socialist Republic Academy of Sciences, Minsk]

[Abstract] The waste water of a factory producing simple oligoesters was studied with the intent of finding microorganisms that use oligoesters as a source of carbon and energy and thus purify waste water. Only five percent of

the 120 bacterial clones obtained from a synthetic nutritive culture metabolized the substrate in less than 24 hours. The rate of oxypropylated glycerin degradation by the bacterial strains is not related to the amount of biomass forming, but is rather associated with the total dehydrogenase activity of the cell. Pseudomonas sp. 66 was selected from the six most active strains for further research. Its optimum pH was between 7.0 and 8.0, though it was viable from 3.0 to 11.0. The temperature substantially affects the duration of the growth phase, as indicated by the fact that decreasing the fermentation temperature from 30°C to 22°C results in a 73 percent increase in the yield of biomass. Increasing the cultivation temperature to 38°C is accompanied by biochemical alterations in the cell membrane with a decrease in the secretion of some proteins and subsequent accumulation of them in the cells. The microbial purification of local industrial waste water can be organized, with the biomass obtained used as fertilizer. Figures 1; tables 2; references 5 (Russian).

UDC 579.841.11.083.3

Specificity of Immune Serum to Exocellular Lipopolysaccharide Pseudomonas Wieringae

907C0631B Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 52 No 1, Jan-Feb 90 (manuscript received 23 Mar 89) pp 44-47

[Article by L. M. Yakovleva, G. M. Zdorovenko, R. I. Gvozdyak, I. Ya. Zakharova, and T. M. Averkiyeva, Institute of Microbiology and Virology, Ukrainian Soviet Socialist Republic Academy of Sciences, Kiev]

[Abstract] A specific immune serum was isolated based on extracellular O-antigenic substances of Pseudomonas syringae phytopathogenic bacteria as part of a continuing search for serologically specific substances from bacteria, the antisera to which would be specific for certain groups of microorganisms. The extracellular lipopolysaccharide from P. wieringae 7923, which was found to be related to P. syringae, was the subject of research. In agglutination reactions of strains of P. syringae pathovars with sera of various origins, 84.03 and 89.7 percent were positive, while 15.97 and 10.3 percent were negative. Research also showed that other bacteria of the genus Pseudomonas as well as strains of bacteria from the genera Erwinia, Bacillus, Xanthomonas, Corynebacterium, and Klebsiella did not react positively with the extracellular lipopolysaccharide of P. wieringae. The extracellular lipopolysaccharide is immunogenic with an antigen specific for P. syringae, indicating that the immune serum isolated is species specific. Tables 2; references 17: 5 Russian, 12 Western.

UDC 579.841.4:622

Adhesion of Methane-Oxidizing Bacteria to Rocks in Coal Mines

907C0631C Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 52 No 1, Jan-Feb 90 (manuscript received 5 Jan 89) pp 73-77

[Article by I. K. Kurdish, V. N. Kravchuk, O. V. Yegorov, V. I. Karpenko, and Yu. R. Malashenko, Institute of Microbiology and Virology, Ukrainian Soviet Socialist Republic Academy of Sciences, Kiev]

[Abstract] The application of a suspension of methane-oxidizing bacteria, Methylomonas rubra and Methylococcus thermophilus, to rocks in coal mines has been suggested as a means of eliminating the methane gas that accumulates in the mines. The number of bacteria adhering to the rocks increases in time, reaching 60-90 percent at 3 hours of contact, with Mm. rubra demonstrating more mobility than Mc. thermophilus. The smaller-sized particles were much more adhesive than the larger ones, and the total number of particles that adhered to the rocks was proportional to the concentration of cells in the suspension. The methane-oxidizing bacteria adhere more quickly to coal than the rocks. More effective means of immobilizing methanotrophs on rocks need to be sought for oxidizing methane in coal mines. Figures 4; references 17: 13 Russian, 4 Western.

UDC 579.69:620.193.8

Destruction of Emulsion and Semisynthetic Lubricants and Coolants by Fungi and Bacteria

907C0631D Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 52 No 1, Jan-Feb 90 (manuscript received 7 Jul 88) pp 77-83

[Article by Z. M. Kartavtseva and N. M. Matsynina, Central Laboratory of Lubricants and Coolants, Kama Motor Works, Naberezhnyye Chelny]

[Abstract] The vulnerability of some lubricants and coolants (Ukrinol-1, Akvol-11, Karbamol P-1, and Avtokat) manufactured in the Soviet Union to fungi and bacteria was determined, and growth aspects of the fungi and bacteria in them were studied. All of the fluids were infected with the fungi and bacteria at varying rates, with Ukrinol infection proceeding most slowly. There is an inverse relation of the rate of plating of fungi from the lubricants and coolants in the agarose culture to the rate of formation of fungi biomass. Suppression of bacteria growth was demonstrated to markedly increase the growth of fungi. The fungi in the lubricants and coolants compete with the bacteria if the concentration of the latter is less than 10^7 cells/ml, and are not found at bacteria concentrations greater than 10^9 cells/ml. Fungal concentrations of 10^2-10^3 cells/ml are dangerous for the lubricants and coolants and will clog filters and toolholders. In contrast to fungi, the number of bacteria in the lubricants and coolants depends directly on the pH of the emulsion. The growth aspects of both fungi and bacteria need to be considered jointly in developing a means of protecting lubricants and coolants with biocides. Tables 5; references 19: 14 Russian, 5 Western.

UDC 614.7:[613.164+613.167]:629.73

Health Regulation of Physical Factors in Residential Areas Generated by Neighboring Civil Aviation Installations

907C0510A Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 24-26

[Article by V. N. Soldatchenkov, Kiev Scientific Research Institute of General and Communal Hygiene imeni A.N. Marzeyev]

[Abstract] Special assessment was conducted on the health aspects of various forms of electromagnetic fields produced by civil aviation installations, particularly as they affect adjacent residential areas. The study concentrated on medium, high, very high, ultra high and super high frequencies, and was designed to determine maximum permissible intensities of electromagnetic fields in relation to energy, frequency, and estimated duration of exposure. Extensive monitoring, in conjunction with animal experimentation, led to the conclusion that the maximum permissible intensities in residential areas for medium, high, and very high frequencies should be set at 14, 12, and 4 V/m, respectively. In addition, a comprehensive evaluation of the health aspects of such installations on the local population must include assessment of the noise factor. Tables 1; references 6 (Russian).

UDC 613.647+613.167/.168]:621.397.13

Health Regulation of Electromagnetic Fields Created by Telecommunication Installations

907C0510B Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 26-29

[Article by I.I. Karachev, Kiev Scientific Research Institute of General and Communal Hygiene imeni A.N. Marzeyev]

[Abstract] In order to better assess the potential health effects of telecommunication installations on the local population, comprehensive studies were conducted on the biological effects of long-term exposure of albino rats to very high (VHF) and ultrahigh frequency (UHF) electromagnetic fields. The animals were exposed to the 14-96 V/m VHF (80 and 202 MHz) and UHF (546 MHz) fields for 14 h/day for 120 days. Evaluation of physiological, biochemical, hematologi, immunologic, and cytogenetic parameters led to determination of innocuous exposures and formulation of the maximum permissible intensities. For example, the maximum permissible intensity for 48.4 MHz VHF electromagnetic field was calculated at 5 V/m, while for a 300 MHz UHF field a value of 2.5 V/m was derived. Tables 1; references 12: 9 Russian, 3 Western.

UDC 613.647:621.37

Health Risk Assessment and Standardization of 50 Hz Magnetic Fields

907C0510C Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 30-32

[Article by L.F. Zyubnova, V.B. Karamyshev and V.G. Shestakov, Kharkov Scientific Research Institute of Labor Hygiene and Occupational Diseases]

[Abstract] Human observations and animal studies were conducted to assess the biological consequences of exposure to magnetic fields with a frequency of 50 Hz, in view of the extensive industrial use of appliances and equipment producing such fields. The study was based on comprehensive physiological evaluation of 180 welders and individuals in related occupations, as well as on male rats subjected to 75-7500 A/m magnetic fields for 2 to 7 months. In general, the resultant data revealed similarities in the adverse effects, with the degree of deterioration dependent on temporal and energy parameters of exposure. The effects were more profound with an increase in the intensities, duration of exposure, and a decrease in the interval between exposures. These observations indicate that each appliance or piece of equipment has to be evaluated on an individual basis depending on the energetic and temporal characteristics of the magnetic field that is being produced. References 6 (Russian).

UDC 613.168-07

Health Risk Assessment of Complex Spectrum Low Frequency Magnetic Fields

907C0510D Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 24 Oct 88) pp 32-36

[Article by V.M. Shtemler, R. Sudibye, N.M. Sokolov, and A.N. Kuznetsov, Scientific Research Institute of General and Communal Hygiene imeni A.N. Sysin, USSR Academy of Medical Sciences, Moscow]

[Abstract] Evaluation of the low-frequency magnetic fields produced by various domestic appliances such as electric shavers, mixers, juicers, etc., revealed considerable spectral heterogeneity, a fact calling into question the validity of current methods of health risk assessment. As a result, it appears that estimation of the root-mean-square value of the intensity of the variable field produced by an appliance does not provide a valid indication of health risk because of the spectral complexity of the field. Rather, in view of the spectral heterogeneity, assessment should preferably be based on the root-mean-square value of the rate of field induction. Tables 1; references 12: 8 Russian, 4 Western.

UDC 614.7:613.647]-07

Physiological Criteria for Developmental Health Risk Assessment of 2750 MHz Electromagnetic Field

907C0510E Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 36-39

[Article by N.S. Polka, Kiev Scientific Research Institute of General and Communal Hygiene imeni A.N. Marzeyev]

[Abstract] Prepubertal rats, 35.5 gm in weight, were selected for studies on the effects of 2750 MHz electromagnetic field (EMF) in order to assess the possible health effects of radar on the developing organism. The animals were exposed to 50, 100 or 200 $\mu W/cm^2$ EMFs for 16 h/day for 4 months, with monthly monitoring of a number of psychophysiological, metabolic, and hematologic parameters. The study demonstrated that during the first two months of exposure to the 2750 MHz EMF the neurological corellates were indicative of activation of the central nervous system (CNS), followed by attenuation of CNS processes in the last two months. Concomitantly, metabolic changes demonstrated that EMF enhanced glycogenolysis and inhibition of respiratory enzymes. Hematologic changes consisted of a reduction in erythrocyte concentration beginning with the second to third month, a marked drop in the hematocrit during the second month, and elevation of reticulocyte counts after the first month. In general, these changes persisted for a month after exposure was discontinued. In addition, a tendency to leukopenia and a shift to the right were also noted. Finally, the animals lagged in weight gain in comparison with control animals. On the basis of regression analysis the threshold limit value for the 2750 MHz EMF was set at 15 $\mu W/cm^2$. Tables 2; references 4 (Russian).

UDC 613.647-07

Biomedical Aspects of Modulated High Frequency Emissions

907C0510F Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 39-41

[Article by T.V. Kalyada and V.N. Nikitina, Leningrad Scientific Research Institute of Labor Hygiene and Occupational Diseases]

[Abstract] Examination of personnel at radiotransmitting installations has shown that 44.3 percent suffer from central nervous system (CNS) disturbances and 34.7 percent from cardiovascular disorders, considerably higher than the statistics for control cohorts (8.9 and 6.7 percent, respectively; $p < 0.001$). There were also more frequent complaints of headaches and chest pain. Accordingly, to further define the effects of long-term exposure to high frequency electromagnetic radiation, albino male rats were exposed to code-modulated and unmodulated 13 MHz, 500 W/m electromagnetic fields. Monitoring of a number of hematologic parameters revealed that low-entropy animals, i.e., animals with low baseline motor activity, responded with a statistically significant reduction in reticulocytes, total leukocytes, segmented neutrophils, and monocytes, while eosinophils showed a significant rise following unmodulated electromagnetic radiation. Low-entropy animals responded with a fall in reticulocytes and an increase in the total number of leukocytes, and a decrease in the number of eosinophils. Intermediate rats were found to be refractory. In addition, these observations also demonstrated that modulated electromagnetic radiation exerted a much more profound hematologic effect in the susceptible animals than did the unmodulated radiation. Figures 1; tables 1; references 4 (Russian).

UDC 613.647-092.9-07:616.8-091.8

Experimental Analysis of Microwave Bioeffects: Systemic, Ultrastructural and Neuronal Mechanisms

907C0510G Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 41-45

[Article by N.N. Vasilevskiy, N.B. Suvorov and M.V. Medvedeva, Scientific Research Institute of Experimental Medicine, USSR Academy of Medical Sciences, Leningrad]

[Abstract] Cats were employed in an analysis of central nervous system (CNS) effects of 500 $\mu W/cm^2$ 2375 MHz electromagnetic fields (EMF) as part of a collaborative USSR-USA program. The experimental approach entailed evaluation of EEG patterns and correlations among different formations, and ultrastructural examination of the lateral area of the hypothalamus. The animals were irradiated for 8 h/day for a total of 200 h. EEG monitoring showed that exposure to EMF resulted in synchronization of the 6-10 and the 12-16 Hz bands. Ultrastructural evaluation revealed extensive cellular disorganization, decreased synaptic areas, and concentration of synaptic vesicles in the center of the presynaptic regions. Although the changes were even more pronounced 3 months after irradiation was discontinued, after 6 months reversal was apparent. Although none of the changes could be described as specific to microwaves, they reflected the effects of prolonged exposure to EMFs. Tables 1; references 21: 15 Russian, 6 Western.

UDC 613.167/.168:614.4

Health Risk Assessment of Electromagnetic Fields Caused by Meteorological Radars

907C0510I Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 10 Feb 89) pp 48-50

[Article by N.G. Nikitina and D.S. Ivanov, Ukrainian Scientific Hygienic Center, Ukrainian Soviet Socialist Republic Ministry of Health, Kiev]

[Abstract] The health risks associated with meteorological radar may be controlled in two ways. In one approach technological improvements are intended to provide superior radar capabilities without an increase in the strength of the electromagnetic field (EMF) in a given vicinity. In the second approach the probability of a health risk is correlated with the strength of the EMF in setting acceptable limits on the latter. Under the best of circumstances, introduction of a new radar installation may actually reduce the risk if it replaces older equipment that was not engineered with current safety standards in mind. Additional calculations are presented for the case of two channel meteorological radars, demonstrating that the net biological effect may be additive, synergistic, or antagonistic. Figures 2; references 5 (Russian).

UDC 613.647:621.37

Calculation of Health Risk Probability of Electromagnetic Fields

907C0510K Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 73-75

[Article by D. S. Ivanov, Kiev Scientific Research Institute of General and Communal Hygiene imeni A.N. Marzeyev]

[Abstract] Presentation is made of the mathematical treatment of statistical data for the calculation of health risk probabilities of electromagnetic fields. The approach taken involves determination of the maximum innocuous level of the electromagnetic field based on animal studies, with extrapolation to humans based on correlation of animal exposure times to equivalent time values for humans. The innocuous animal threshold is then converted to human threshold limit values. This approach does not replace assessment of threshold limit values based on morbidity patterns, but rather constitutes a complementary technique. Tables 1; references 5 (Russian).

UDC 613.647-07:612.82

Central Nervous System Function in Health Risk Assessment of Industrial Frequency Electric Field

907C0510L Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 78-79

[Article by I. S. Bezdolnaya, Kiev Scientific Resarch Institute of General and Communal Hygiene imeni A.N. Marzeyev]

[Abstract] Thirty male students 20-25 years of age were employed in a study designed to test the central nervous system (CNS) health risks involved in exposure to a 50 Hz (industrial frequency) 15 kV/m electric field. The results demonstrated that exposure for 60 or 90 min per day for 20 days led to predominance of excitatory over inhibitory processes, reduction in the α-index, the latent period for α-rhythm desynchronization, and in the latent periods of conditioned responses to simple sensory motor stimuli. None of the memory parameters were affected. In the case of 90 min exposure variable changes were also noted in function of cutaneous cold receptors. These observations underscored the unique lability of the CNS vis-a-vis 50 Hz electric fields, and that fact that with longer exposures higher hierarchical levels of the CNS are involved. References 12 (Russian).

UDC 613.647-07:612.112.94.015.1

Effect of Industrial Frequency Electromagnetic Fields on Lymphocyte Enzymology in Animals Following Assessment of Adaptational Reactions

907C0510M Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 80-81

[Article by V.D. Dyshlovoy, A.S. Yanovskaya and T.S. Chaplinskaya, Kiev Medical Institute]

[Abstract] Male and female BALB and C57BL/6y mice were exposed to industrial frequency 750 kV/m electromagnetic fields in order to determine whether lymphocyte enzymology may be used as an indicator of susceptibility. The animals were subjected to 1 to 30 exposures, each lasting 5 h, followed by determination of several dehydrogenases, acid phosphatase, and RNA concentration. Cytochemical data revealed species differences as well as the fact that the C57BL/6y mice were more susceptible to the effects of irradiation than the BALB mice, indicating that lymphocyte enzymology may be used as a susceptibility indicator. In addition, the data also revealed a dose-related lymphopenia, although some reversal was noted toward the end of the experiment. In addition, lymphohistiocytic infiltration was noted in perivascular spaces, myocardium, liver, kidneys, and other organs. The thymus had a large number of damaged lymphocytes. References 6: 5 Russian, 1 Western.

UDC 612.821+612.76].014.426

Functional Asymmetry as Indicator of Biological Activity of Super High Frequency Electromagnetic Fields

907C0510N Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 81-82

[Article by Ye. F. Stoyan, Kiev Scientific Research Institute of General and Communal Hygiene imeni A.N. Marzeyev]

[Abstract] An analysis was conducted on functional asymmetry in children undergoing therapy for nonspecific respiratory diseases with super high frequency (SHF) fields directed at the thorax (Luch-2 apparatus, 12.6 cm wavelength, 2375 MHz, 5 W output, 10 min/day for 10 days). Examination of the children demonstrated

that the therapeutic modality in question resulted in a significantly greater increase in skin temperature on the right side of the chest in comparison with untreated children, while the temperature on the other side was unaffected. The latter phenomenon was interpreted to reflect activity of cardiovascular reflex mechanisms intended to prevent overheating of the cardiac area. The tactile sensitivity of the right hand was also shown to be more susceptible to the SHF field than the left hand, and the diastolic blood pressure in the left hand was significantly lower than in the right. In addition, right handedness was replaced by ambidexterity during irradiation. These observations indicate that changes in functional asymmetry under the influence of low level SHF fields may be a useful parameter in health risk assessment of such physical factors. References 10 (Russian).

UDC 613.647+614.875]-07:612.76

Locomotion Parameters of Animals in Health Risk Assessment of Microwave Radiation

907C0510O Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 82-85

[Article by M.A. Navakatikyan and S.I. Nogachevskaya, Kiev Scientific Research Institute of General and Communal Hygiene imeni A.N. Marzeyev]

[Abstract] Female Fisher rats (150-250 g) were used in open-field and maze tests to assess the effects of microwave irradiation (2450 MHz, 1 mW/cm^2, 7 h/day for 10-45 days) on locomotor activity. The data showed that, in general, motor activity was depressed in a dose-dependent manner in both tests. However, animals irradiated for 30 days in the open-field or free-running trials reflected some degree of activation of locomotor activity, a trend reflected to a lesser extent in the maze studies. The factors responsible for the apparent activation remain enigmatic and point to the need for further research along these lines. Tables 3; references 22: 11 Russian, 11 Western.

UDC 613.647-07:[612.235+612.261].014.49

Effect of Microwave Irradiation on Adaptive Reactions of Blood Oxygen Transport System

907C0510P Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 4 Oct 88) pp 85-87

[Article by V.P. Artyukh, Kiev Scientific Research Institute of General and Communal Hygiene imeni A.N. Marzeyev]

[Abstract] Outbred male rats, 200-250 g in weight, were subjected to microwave irradiation (2450 MHz, 10 mW/cm^2, 7 h exposure) in order to assess the effects on oxygen transport. Acid hemolysis studies showed that irradiation led to a 50 percent reduction in hemolysis time, and that older cells were more sensitive. The microwave mechanisms of action evidently involve a direct effect on the erythrocyte membrane as well as indirect mechanisms via the neuroendocrine axis. Figures 1; references 20: 10 Russian, 10 Western.

UDC 613.647:621.319]:[612.26+612.015.1].014.424

Effects of Long-Term 120 kV/m Electrostatic Fields on Monoaminergic Systems and Energy Metabolism Enzymes in Rats

907C0510Q Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 12 Oct 88) pp 89-90

[Article by F.G. Portnov, A.P. Iyerusalimskiy, L.F. Vorobyeva, B.L. Dundure and Yu.M. Porozov, Department of Biomedical Problems of Electrical Engineering, All-Union Scientific Research Engineering and Technological Institute of the Cable Industry, Yurmala]

[Abstract] Male Wistar rats (180-200 g) were selected to assess the effects of long-term exposure to 120 kV/m (1.7 μA/m^2) electrostatic fields on the monoaminergic system and ATPase activity of erythrocyte membranes. The study revealed certain time-dependent changes, consisting of, for example, a 47 percent reduction in the dopamine/norepinephrine ratio in the diencephalon brain after 3 months. One month after 4 months of exposure most of the changes in the dopaminergic and noradrenergic neurons approached baseline values. A transient elevation of serotonin was noted in the brain stem, diencephalon and the basal ganglia after 3 months, while erythrocyte membrane Mg^{2+}-ATPase activity was significantly depressed after 2 and 3 months. These findings provide additional proof that health safety standards need to be established for common electrostatic fields. Tables 1; references 9: 6 Russian, 3 Western.

UDC 613.647+613.168]:621.396

Analysis of Current Production of Soviet Publications on Biological Effects of Radiofrequency Electromagnetic Fields

907C0510R Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 12 Oct 88) pp 90-92

[Article by G.I. Leonskaya, M.Yu. Antomonov, V.I. Bezzub and L.P. Munina, Kiev Scientific Research Institute of General and Communal Hygiene imeni A.N. Marzeyev]

[Abstract] An analysis was conducted on the rate of appearance of Soviet publications dealing with the biological and health aspects of radiofrequency electromagnetic fields. The data, covering the 1975-1985 timeframe, encompassed monographs, collected works, journal articles, conference proceedings, patent literature, discoveries, and so forth. The analysis demonstrated that research papers are being published in 59 journals, with the most productive journals identified as VOPROSY KURORTOLOGII, FIZIOTERAPII I LECHEBNOY FIZICHESKOY KULTURY, GIGIYENA I SANITARIYA, and VRACHEBNOYE DELO. Although access to information contained in

these three journals presents no problem for the specialist, reliance on these journals alone deprives a scientists of 50 percent of the available information. In general, the flow of publications has remained more or less steady during the timeframe in question, with a moderate increase largely limited to works dealing with discoveries. The data indicate that in the foreseeable future the rate of production of publications dealing with radiofrequency fields will remain at the present level. Figures 1; tables 1; references 7 (Russian).

UDC 616-073.8:[616.13/14+616.8]

Novel Applications of Constant Magnetic Fields in Neuroangiology

907C0533C Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 2, Feb 90 (manuscript received 19 Jul 89) pp 95-104

[Article by G. I. Eninya, I. P. Logina, V. A. Chernyakov and I. Kh. Mayore, Riga Medical Institute]

[Abstract] Therapeutic trials were undertaken with a cylindrical samarium-cobalt magnet for managing 180 patients in the early stages of cerebrovascular insufficiency. The magnet was positioned in a manner designed to impart an intravascular induction of 20-30 T in the internal carotid artery, with the south pole applied to precerebral segment of the artery perpendicular to the longitudinal axis of the artery. The clinical and laboratory evaluations demonstrated that 76-93 percent of the patients responded favorably for a month when treated unilaterally for 24 h per day for 7 days. The improvements in regional hemodynamics were attributed to normalization of hemostatic indicators and rheologic parameters. An alternative approach consisting of magnetic therapy for 15-120 min per day for 7 days involved a greater degree of circadian fluctuations in hemodynamics and was of less clinical benefit. After one month improvements were noted in only 83 percent of the patients in the latter group. Figures 3; tables 1; references 25: 23 Russian, 2 Western.

UDC 616.835.56

Symptoms of Acute Trichloronitromethane Inhalation Lesions

907C0607B Kiev VRACHEBNOYE DELO in Russian No 1, Jan 90 (manuscript received 2 Nov 87) pp 104-106

[Article by I. K. Asaulyuk]

[Text] Trichloronitromethane (CCl_3NO_2) is a powerful chemical poison and is often used for rat and insect extermination procedures [2]. The preparation is a colorless, oily liquid with a sharp, irritating odor and is highly volatile (0.184 g/l at 20°). Its minimal active concentration is 0.002 mg/l, and its intolerance dose is 0.05 mg/l (2 minutes). It is easily absorbed and desorbs very slowly, particularly at low temperatures [3]. At a concentration of 0.009 mg/ml it is a very epiphoric and irritating. A concentration of 2 mg/l and exposure for 10 - 15 minutes results in toxic pulmonary edema and death [1]. In addition, trichloronitromethane possesses neuroreflexive and resorptive activity. Mild, moderate, or severe pulmonary lesions can result from exposure depending on the concentration of trichloronitromethane vapors and the condition of the exposed organism. The course of poisoning is marked by three periods: irritation or reflex responses (at the moment of trichloronitromethane contact), a latent period (average of two to five hours), and the onset of pulmonary edema.

We observed 13 persons who developed trichloronitromethane poisoning in the course of treating work areas. The victims were on the premises for four to 15 minutes: Two persons were exposed less than five minutes, 10 persons were exposed from five to ten minutes, and one person was exposed less than 15 minutes. Eleven persons were found to have a severe form of intoxication, and two persons had a mild form. All of the patients exhibited ocular colic, lacrimation, burns on the neck, axillary region, and hands, and a burning sensation in the mouth, tickling in the throat, a distressing unproductive cough, an unpleasant taste in their mouths, and nausea. Nine patients had moderate pains behind their sternum.

Within the first 30 to 50 minutes after they left the premises these phenomena almost disappeared in four persons and were significantly reduced in nine persons. However, after two to three to five hours all of them again exhibited intensive cough, pronounced sternal pain, difficult breathing, dyspnea, increasing general weakness, and rapid fatigue. In addition, the cases of severe poisoning were accompanied by nausea, vomiting, diarrhea, stomach pains, headache, tachycardia, cyanosis, hyperemia of the face, neck, ocular mucosa, scleral injection, puffiness of the face, and emotional instability.

Pulmonary auscultation throughout the entire period demonstrated dry, disperse, sibilant, and droning bilateral rales that became more intense with forced breathing and slight physical exertion.

Thus, the phases of injury symptomatics comprising irritation, the latent period, and the development of symptoms were observed in all of the patients. The latent period, however, was shorter or absent in the severely afflicted persons. The symptomatics of the first and second periods were similar in all of the victims, whereas the clinical picture of intoxication after the second period (2-3-5 hours) manifested itself in different ways. The gravity of the condition was determined by the degree to which the pathological process had spread in the lungs as well as by concomitant lesions of the air passage ways and other organs and systems (toxic hepatitis, nephropathy, myocarditis). Thus, diffuse dry, sibilant, and droning rales were heard over the entire lung area in 10 of the 13 patients as well as prolonged expiration. There was loss of resonance in the lower rear regions. Auscultation there demonstrated harsh breathing that was somewhat weakened and a few fine and medium bubbling rales. In a background of emphysematous lungs and a magnified bronchovascular x-ray, there were small, medium, and macrofocal shadows with uneven, blurred borders.

After intensive therapy in the first minutes of poisoning and for a period of 12 to 16 hours the toxic pulmonary edema that was observed in 11 severely afflicted persons was arrested within twenty-four hours. This made it possible to reduce significantly oxygen insufficiency. A special clinical feature of toxic pulmonary edema was the absence of intensive frothing in the trachea and bronchi which was apparently related to the timely application of intensive therapy. Irritable bronchospastic syndrome of variable intensity was correlated with the degree of lesion severity in all 13 patients.

The clinical picture of toxic pneumonia was marked by a rather rapid inverse development of clinical (after 36 to 48 hours) and x-ray (three to five days) signs. This was interpreted as an abacterial course and no transformation to bacterial pneumonia was found in any of the patients. Toxic pneumonia in all of the patients occurred at a temperature reaction in the subfebrile range (37.3 - 37.7°C).

A significant role in the clinical manifestations of trichloronitromethane poisoning that caused hypoxia was played by circulatory disturbances due to reflex disturbances as well as hypoxia, elevated blood viscosity, and the accumulation of incompletely oxidized metabolic products in the blood.

All of the patients complained of pains in the heart region and palpitations. First degree atrioventricular block was noted in the ECG of two of the 11 patients with severe poisoning. Tachycardia was demonstrated in nine patients, and bradycardia was found in two patients. T-wave was flattened or smoothed in nine patients. Signs of pronounced ischemia were found in one, and sinus arrhythmia in two patients. In nine patients auscultation demonstrated muffled tones. The first tone was segmented and had a dull accentuation (like "hitting an empty barrel"). During the first hours

after exposure seven of the patients exhibited elevated arterial pressure up to 150/100 - 160/100 mm Hg which was apparently due not only to the stress situation but to bronchospastic syndrome and reflex constriction of the pulmonary vessels. Injury to the heart was evaluated as toxic myocarditis.

Eleven patients exhibited external respiration disturbance (lowered VC and FVC, expiratory pressure, ratio of maximal pulmonary ventilation to required maximal pulmonary ventilation, and other indices). Restoration began after 18 to 20 days. Toxic hepatic injury (toxic hepatitis) was indicated by elevated blood levels of total bilirubin (to 24 - 26 μmoles/l), especially conjugated bilirubin (up to 6.7 μ moles/l, elevated aminotransferase - ALT - activity up to 1.28 mmoles/(h/L) and AST - up to 0.94 mmoles/(h/L) and lowered glucose-6-phosphatase levels. Toxic renal injury was indicated by elevated blood urea (up to 9.2 μ moles/l and creatinine (up to 260 μ moles/l as well as by changes in the urine (slight proteinuria and cylindruria).

On the second and third days following exposure there was an increase in the prothrombin index of up to 110 - 140 percent and fibrinogen content (4.3 g/l and more) which indicated hypercoagulation resulting from fluid loss and pachyemia. During the first three days the elevated red blood cell count was more than $5 \cdot 10^{12}$/l and the hemoglobin count was up to 163 g/l in eight persons. Moderate leukocytosis ($10 \cdot 10^9$/l to $16 \cdot 10^9$ was observed in 11 persons and an elevated erythrocyte sedimentation rate was observed in six persons.

The dynamics of certain acid-base indices for the blood were examined in severely poisoned persons during the first days of their exposure and were evaluated as a manifestation of moderately pronounced respiratory acidosis (pH - 7.34 - 7.35; pCO_2 - 41.3 - 45.0). Strict bed rest was prescribed for all of the patients along with the extensive use of oxygen in order to eliminate oxygen starvation, acidosis, pulmonary edema, and circulatory disturbances.

Euphylline, furosemide or lasix, and glucose were employed in the case of pulmonary edema. Agents used to decrease vascular permeability included calcium chloride or gluconate, ascorbic acid, and vitamin P. Cardiac glycosides (corglykon or strophanthin) and analeptics (Cordiamin and Corazol) were prescribed to improve cardiovascular function.

Acidosis was arrested by the use of sodium bicarbonate. Broad spectrum polysynthetic antibiotics were prescribed to prevent bacterial pneumonias. Various symptomatic agents were used as required, including isoprenaline spray, corticosteroids, and antibiotics to eliminate bronchial spasms, local inflammatory phenomena, and to prevent infection complications.

The principal task during the reflex period was to eliminate the irritation of mucous respiratory pathways. Prescribed for this purpose were sodium bicarbonate gargles for the mouth and nasopharynx, inhalation of ephedrine and Euphylline sprays, etc. Codeine and dionine were prescribed to reduce coughing. All of the patients exhibited clinical recovery following treatment. The average hospital stay was 15 days for persons with mild cases of poisoning and 27 days for the severe cases.

Thus, the principal sign in acute trichloronitromethane inhalation poisonings is bronchospastic syndrome. In severe poisoning, the principal sign is toxic pulmonary edema. In addition, trichloronitromethane has a direct toxic and resorptive effect on the liver, kidneys, and cardiovascular system. Clinical recovery was observed in all the victims upon the application of the indicated complex of therapeutic measures.

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UDC 612.821.2+612.8.015

Effect of Local Injection of 5,7-dihydroxytryptamine and 6-hydroxydopamine Into Neocortex on Learning and Investigatory Behavior of Rats in Open Field

907C0098A Moscow ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI IMENI I. P. PAVLOVA in Russian Vol 39 No 3 May-Jun pp 548-555

[Article by Kh. Yu. Ismaylova, G. G. Gasanov, T. P. Semenova, N. V. Bobkova, I. V. Nesterova and Ye. A. Gromova; Institute of Physiology imeni A. I. Karayev, Academy of Sciences AzSSR, Baku, Institute of Biological Physics, Academy of Sciences USSR, Pushchino: "Effect of Local Injection of 5,7-dihydroxytryptamine and 6-hydroxydopamine Into Neocortex on Learning and Investigatory Behavior of Rats in Open Field"]

[Abstract] Experiments were performed on 32 male Wistar rats (weight 220-240 g) placed in one of four groups: 1- control rats (12) with brain intact, 2- pseudo-operated rats (4), subjected to implantation of a cannule and receiving intracortical injections of physiological solution, 3- rats (8) receiving an injection of 5,7-dihydroxytryptamine, a toxin which destroys serotoninergic terminals and 4- rats (8) injected with 6-hydroxydopamine, a toxin which destroys catecholaminergic terminals. Rat behavior was assessed according to indicators of learning and investigatory behavior. Bilateral local injection of 6-hydroxydopamine (12 microg/4 microl) into the neocortex weakened investigatory activity of the rats in an open field and increased the time of fulfillment of a formed conditioned-reflex food-reinforced reaction. Bilateral local injection of 5,7-dihydroxytryptamine (24 microg/4 microl) into the neocortex intensified investigatory activity of the rats in an open field and reduced the time of fulfillment of the formed conditioned reflex food-reinforced reaction. Injection of 6-hydroxydopamine into the neocortex reduced the catacholamines level in the frontal region of the neocortex and hippocampus. An equal injection of 5,7-dihydroxytryptamine reduced the level of 5-HT and its metabolite significantly in these structures and changed the catecholamines level, indicating the lesser specificity of the neurotoxin 5,7-dihydroxytryptamine than that of 6-hydroxydopamine. Damage to structures of the serotoninergic or catecholaminergic systems of the frontal cortex and hippocampus caused by local injection of the toxins produced differently-directed changes of behavior of the rats. Figures 4; references 24: 9 Russian; 15 Western.

UDC 612.821.6+612.8.015

Characteristics of Water and Sodium Chloride Solution Lapping by Rats After Litorin Injection Into Lateral Ventricle

907C0098B Moscow ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI IMENI I. P. PAVLOVA in Russian Vol 39 No 3, May-Jun 89 pp 561-563

[Article by A. I. Yesakov, deceased and P. A. Ishanov, Institute of Normal Physiologyy imeni P. K. Anokhin, Academy of Medical Sciences USSR, Moscow: "Characteristics of Water and Sodium Chloride Solution Lapping by Rats After Litorin Injection Into Lateral Ventricle"]

[Abstract] Study of the effect of central injection of the bombesin-like peptide litorin on characteristics of water and sodium chloride solution lapping involved 50 mongrel rats (weight 250-300 g). After 48 hours of deprivation of water, rats were placed in a test chamber with water or a 1 percent solution of sodium chloride being available. Litorin was injected in the test chamber into the lateral ventricle via a microsyringe in a dose of 5 microl. One series of experiments involved injection of 50 ng of litorin per rat and another series involved injection of 500 ng per rat. Intact rats and rats injected with a physiological solution made up the control group. Results were assessed by the numbe of lappings, the volume of liquid ingested within 5 minutes and the interval between individual lappings. Litorin injection levelled the previously established differences in frequency of lappings of a colored salt solution and of an uncolored solution. Litorin injected reduced the total number of lappings during the experiment and decreased the volume of water and salt solution consumed, indicating a satiating effect of the peptide. Motor activity of the rats (tremor of the front extremities, excess grooming and "wet dog" type of shaking has been associated with the effect of bombesin and litorin on monoamines, especially dopamine, metabolism in rat brain. The effect observed in this study indicated specific changes in mechanisms of taste analysis and consummator activity due to the effect of the peptide on monoamines metabolism in the brain. References 5: 1 Russian; 4 Western.

Physiology

UDC 612.821.2+612.8.015+612.821.6

Compensation of Behavioral Disorders in Rats Neonatally Administered 5,7-Dihydroxytryptamine by Transplantation of Embryonal Raphe Nucleus Tissue

907C0624B Moscow ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI IMENI I. P. PAVLOVA in Russian Vol 40 No 1, Jan-Feb 90 (manuscript received 20 Feb 89; after revision 12 Apr 89) pp 156-164

[Article by T. P. Semenova, Ye. A. Gromova, N. I. Grishchenko, I. V. Nesterova, A. G. Bragin, O. S. Vinogradova, A. V. Kulikov, G. N. Smirnova, and T. M. Tretyak, Institute of Biological Physics, USSR Academy of Sciences, Pushchino]

[Abstract] The potential for employing transplantation of embryonal raphe nucleus tissue to compensate for behavioral disorders caused by dysfunction of the serotoninergic system in the brain was studied. The activity of the serotoninergic system was chronically depressed in 62 male Wistar rats by administering 5,7- dihydroxytryptamine (DHT) on a daily basis shortly after birth. Transplantation of the embryonal tissue was performed at 1.5 months using tissue from 17-18 day old Wistar rat embryos. The behavior of the rats was characterized by their activity in an open field, sensory attention, and discrimination among emotionally positive influences. Histologic examination of the rat brains demonstrated that the transplants were still in place and functional with most of the transplant material surrounded by scar

tissue, though there were areas of direct fusion of the transplant and recipient tissues. A slight increase in the serotonin content of the brain and neocortex is probably due to the growth of serotonin fibers from the transplant. The transplanted neurones of the raphe nuclei compensated for the instinctive behavior disturbed by the serotonin deficit as well as complex forms of exploratory and emotional behavior. Transplantation of the embryonal raphe nucleus tissue into the neocortex of rats that were neonatally administered 5,7-DHT almost completely restores the orientation reaction of the animals to somatosensory and visual stimuli, exploratory activity, and emotional activity to their original levels. These findings confirm the concept of the role that serotoninergic innervation of the neocortex plays in the regulation of sensory attention and reactivity. Figures 4; tables 1; references 22: 10 Russian, 12 Western.

UDC 612.821.6+612.822.3

Effect of Transplantation of Embryonal Brain Tissue (Early Periods) on Avoidance of Artificial and Zoosocial Stimuli in Rats

907C0624C Moscow ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI IMENI I. P. PAVLOVA in Russian Vol 40 No 1, Jan-Feb 90 (manuscript received 12 Jan 89; after revision 21 Apr 89) pp 179-182

[Article by N. G. Mikhaylova, A. V. Zukhar, Ye. V. Loseva, and I. V. Yermakova, Institute of Higher Nervous Activity and Neurophysiology, USSR Academy of Sciences, Moscow]

[Abstract] The effects of nerve transplantation of embryonal tissue of the frontal cortex and hippocampus ("informational pair") and the tonsils and hypothalamus ("motivational pair") were studied on 50 two-month-old male rats weighing 200-250 g to determine whether there were any effects on the individual behavior of the rats after the transplant, and whether the effects differed for the two sets of structures used. The rats were tested for their "emotional resonance" - whether they would choose between 1) a spacious, well-lighted chamber, or a "house", 2) the chamber or a "house" whose floor was a pedal that automatically irritated a partner rat within hearing distance, and 3) the chamber or a "house" whose floor switched on a tone and additional light. The rats were assessed for the average amount of time they spent avoiding the house as well as the average number of entrances into the house. The sounds made by the partner rat when the rat entered the second house had a much more pronounced effect on the latter in the motivational group, while the tone in third house affected the informational group much more strongly, indicating that transplanting the tonsils and hypothalamus had a much more marked effect than that of the frontal cortex and hippocampus. Transplantation of embryonal nerve tissue caused alterations in the individual behavior of the animals, depending on the brain structures involved. The neurochemical factors secreted by the transplant disturb the activity of the structures of the same name in the rat brain. Figures 2; tables 2; references 4: 2 Russian, 2 Western.

Genetic Counseling Center Opens in Panevezhis

907C0044A Vilnius SOVETSKAYA LITVA in Russian 01 Sep p 4

[Article by U. Chesayte under the "News" rubric: "Genetics Office Opens in Panevezhis"]

[Text] The opening of a specialized genetics center is evidence of the great concern being shown about the health of future generations of Panevezhis citizens. The center is located in the building of a women's clinic. Algirdas Utkus, the physician working here, is helping future parents to look into whether some hereditary disease threatens their progeny, and he counsels them about how they may avoid it. At the moment, the doctor has little equipment, but in the very near future, his arsenal will be supplemented with advanced apparatus, and the work of the section, which is so necessary in the city health care system, will be placed on a firm foundation.

UDC 616-001.28-036.11-085.273,3:546,34

Therapeutic Trials With Lithium Carbonate As Leukocyte Stimulant in Acute Radiation Sickness

18402002B Moscow GEMATOLOGIYA I TRANSFUZIOLOGIYA in Russian Vol 34 No 3, Mar 89 (manuscript received 1 Mar 88) pp 16-23

[Article by V.G. Chotiy and A.Ye. Baranov]

[Abstract] Therapeutic trials were conducted with lithium carbonate as a stimulant of granulocytopoiesis in 17 males, 22 to 63 years old, suffering from radiation injuries as a result of the Chernobyl nuclear power plant explosion. A control group consisted of 33 subjects with an age range of 17 to 72 years that had undergone identical radiation exposure. Based on blood lymphcyte levels 6 days after the accident and subsequent determinations of dicentric chromosomal aberrations, the range of exposure in the experimental and control subjects varied from 0.5 to 5.7 Gy gamma rays. In the experimental group conventional antimicrobial and supportive management was supplemented with 900 mg lithium carbonate tablets, t.i.d., for an average of 35 days, commencing 9-10 days after irradiation. Monitoring neutrophil counts in both groups demonstrated that, in distinction to certain other conditions, in patients with radiation sickness lithium carbonate was without benefit in correcting neutropenia. The failure in these patients was tentatively attributed to depletion of hemopoietic stem cells, the presumed target cells of lithium carbonate. Figures 2; tables 1; references 19: 4 Russian, 15 Western.

UDC 616-001.28-036.11-089:616.419-089.843-089.168-07

Bone Marrow Transplantation After Whole-Body Irradiation in Chernobyl

18402002A Moscow GEMATOLOGIYA I TRANSFUZIOLOGIYA in Russian Vol 34 No 3, Mar 89 (manuscript received 26 Nov 87) pp 3-16

[Article by [R.P. Gayl], A.K. Guskova, Ye.K. Pyatkin, R. Champlin, G.D. Selidovkin, L.I. Muravyeva, P. Terasaki, Y. Reisner, N.B. Danilova, L.V. Yevseyeva, L.N. Petrosyan, S.G. Pushkareva, M.V. Konchalovskiy, A.A. Gordeyeva, T.D. Toporkova, T.G. Protasova and L.A. Suvorova, Institute of General Physics and No 6 Clinical Hospital, USSR Ministry of Health, Moscow; University of California School of Medicine, Los Angeles, U.S.A.]

[Abstract] An assessment was conducted on the outcome of bone marrow transplantations performed on 13 victims of the Chernobyl disaster, subjected to whole-body gamma-irradiation with 6.6 to 11.9 Gy. Internal dosage from I-131 and Cs-137 did not exceed 1-3 percent of the total dose (with the exception of two patients). Patient selection was based on irreversible bone marrow depression, with siblings or parents serving as the donors. On the basis of irradiation the patients were divided into three clinical groups: [greater than] 9 Gy, 6.6 to 8.7 Gy, and 4.4 to 6.4 Gy. Seven of the patients succumbed following transplantation, with the deaths attributed to the difficulties involved in early diagnosis of the severity of radiation injuries in patients subjected to high levels of irradiation. The clinical assessment indicated that acute radiation injuries of the skin, gastrointestinal tract, and the lungs in the immediate (7-10 days) post-radiation period lead inevitably to death despite bone marrow transplantation. It appears that bone marrow is not indicated in such patients when they display second the third degree beta-radiation burns over 30-50 percent of the body surface. An additional factor pointing to the futility of transplantation in such patients is the appearance of diarrhea 6-8 days after whole-body irradiation. In addition, four patients were lost because of graft-versus-host reactions and herpesvirus infections within 34 to 91 days (27 and 79 days after transplantation). Two survivors (5.6 and 8.7 Gy) demonstrated chimeric bone marrow patterns and eventually recovery of myelopoiesis ca. 27-28 days after irradiation. These observations demonstrated that a careful evaluation needs to be conducted of the indications for bone marrow transplants with various degrees of histocompatibility, in view of the fact that supportive therapy alone may ensure 100 percent survival even with 6-9 Gy whole-body irradiation. Figures 7; tables 1; references 20: 4 Russia, 16 Western.

New, Portable Dosimeter Developed

907C0044B Moscow IZVESTIYA in Russian 25 Aug 89 Morning Ed p 1

[Article by A. Pokrovskiy: "A Dosimeter for Everyone"; first paragraph is source introduction]

[Text] *Specialists of the All Union Nuclear Power Scientific Research Institute and the USSR Ministry of Health have developed a dosimeter-indicator, and plans call for it to be put into series production in 1990.*

IZVESTIYA more than once has written that a readily available, cheap dosimeter is needed for the population.

In response to our publication about the state of affairs in regions contaminated by radiation, people who must live in them wrote things like, "We are ready to buy dosimeters even if they cost 300 rubles! If we have to, several families will pool their resources to acquire them. Otherwise, we'll be imagining the danger of contamination everywhere. And how can it be verified without instruments?" This anxiety is completely well-founded: people are tired of the long silence about the real condition of things, the endless reassurances, and, plain and simple, the deception, and many no longer believe the specialists. They want to get the facts themselves. And a dosimeter is one method of finding out for sure whether there is radiation danger in your home. The need for such instruments is felt especially acutely in those regions of the Ukraine, Belorussia, and the RSFSR that found themselves in the zone of radioactive contamination after the Chernobyl accident. And the instruments are also needed in regions in which nuclear power plants are operating.

And so, there is a new dosimeter. It is compact, weighs 360 grams, and works on an ordinary Krona battery. One can use it to register the radiation conditions outside, in the home, and in the workplace.

The sensitivity of the dosimeter makes it possible to measure the radiation level from 12-15 microroentgens per hour (natural background) to 1,000 microroentgens per hour.

This dosimeter has different ranges of measurements. The first range is divided into sections—green, yellow, and red. The green section corresponds to the value of natural background radiation. The yellow section corresponds to a radiation level somewhat higher than background. And the red, it indicates a serious situation that may be related to additional radiation. However, this is not always the case. If, for example, the dosimeter is switched on in an airplane at an altitude of about 10 kilometers, the radiation level will be 160-180 microroentgens per hour, and the arrow will point to the red section. Why? The additional radiation in this case is related to cosmic radiation.

The range of the instrument that has been developed is such that it can be used for evaluating radiation conditions when there is an accident.

The price of the instrument will not exceed the cost of a transistor radio.

UDC 616-001.28-02:613.648]-07:613.731]-037

Clinical Psychological Assessment and Prognosis of Mental Fitness and Work Fitness of Individuals Suffering From Minor-Degree Acute Radiation Sickness

907C0123 Moscow GIGIYENA TRUDA I PROFESSIONALNYYE ZABOLEVANIYA in Russian No 7, Jul 89 (manuscript received 13 Apr 88) pp 13-16

[Article by F. S. Torubarov and O. V. Chinkina]

[Text] It is known that, for specified periods in the recovery period, most patients suffering from minor-degree acute radiation sickness do not manifest any somatic illnesses caused by the effect of ionizing radiation that could have a negative effect on the victims' functional mental state or fitness for work.[1-3]

Nevertheless, the experience of expert examination has uncovered a wide variety of functional states and levels of fitness for work among the specified contingent that create additional difficulties in making expert decisions and further work and rehabilitation recommendations. The existence of this variety becomes understandable if the functional condition of patients during this period is viewed not solely as the outcome of the acute radiation sickness, but also as the outcome of a whole system of extreme (including psychological) effects that are typical of an accident. This includes the pattern of the disease itself, which imposes increased demands on a human being's adaptation capabilities. These capabilities are in turn linked to the patient's personality traits and levels of overall and occupational training in the preaccident period.

Four cases occurring after the accident at the Chernobyl AES are used as examples to demonstrate the possibility of using data from a clinical psychological examination in making expert occupational medicine decisions and developing rehabilitation recommendations. The comprehensive clinical psychological examination of the specified cohort included a conversation about attitudes toward the accident and the illness that had resulted; a self-assessment of condition; plans and prospects; reactions to group injury; and the presence of social problems. It also included analysis of complaints; a study of the disease history; specific observation; and a set of psychological test techniques (a differentiated self-assessment of condition test, Ch. Spilberg's reactive and personality anxiety scale, a standardized method of analyzing personality [the MMPI], an analysis of simple sensorimotor response, an analysis of complex sensorimotor activity [i.e., a proofreading test on a PFK-01 device], and an attention span test).

Minor-degree acute radiation sickness from relatively uniform β- and γ-radiation was diagnosed in the cases presented.

Observation 1. The patient is a 44-year-old reactor room chief. From the beginning of the accident, he took part in analyzing the situation, controlling the systems and equipment, and supervising personnel. He has no complaints at the present time. His behavior while doing his job is calm and steady. The calculated time indicators from the analysis of his simple sensorimotor responses are as follows: functional system level, 4.61; response stability, 1.56; level of functional capabilities, 3.27. These levels correspond to the average level of the norm for the functional status of the CNS.

The indicators of the productivity and reliability of his activity and the principle properties of his attention and short-term memory are within the range of the norm. His average productivity on the analysis of complex sensorimotor activity amounted to 53.5 operations per minute, with an average time of $t = 1.96$ seconds spent per operation at $\sigma = 0.358$ seconds. The dynamics of the analysis of his complex sensorimotor activities did not change, and he acquires skills successfully. His self-assessment of condition is adequate and corresponds to the norm (state of health, 5.4; activity, 5.3; disposition, 5.8). An isolated increase in his reactive anxiety is noted with moderate personality anxiety (reactive, 47; personality, 36); some signs of internal stress and intensification of volitional control of activity are socially caused and are adequate for his life situation. A rather high level of functional mental state has been established. This case may serve as an example of a good recovery after minor-degree acute radiation sickness in a patient with appropriate occupational training and good personality traits.

Observation 2. The patient is a 33-year-old senior unit control engineer. During the first hours following the accident, he was at the unit switchboard and performed the duties of the senior turbine control engineer. He complains of pronounced weakness, distraction, forgetfulness, and irritability. His calculated time indicators for the analysis of his simple sensorimotor responses are as follows: functional system level, 4.97; response stability, 2.4; level of functional capabilities, 4.02—which corresponds to a high level of the norm for the functional status of the CNS. The indicators for the principal features of his attention and short-term memory when performing small tasks are high. As he performed the test of complex sensorimotor activities at a rapid pace, he demonstrated a pronounced unevenness in productivity (productivity, 41 operations per minute; $t = 1.623$ seconds with $\sigma = 0.483$ seconds) and reliability of activity (10 percent erroneous operations). By the seventh minute, monotony develops, as does a reduction in work efficiency that is accompanied by autonomic manifestations. His self-assessment of condition is low (state of health, 3.8; activity, 3.6; disposition, 3.1). He manifests a high reactive and personality anxiety (personality, 60; reactive, 54). After the accident, he developed a fear of online work. He feels that he has become overly cautious at work and does not take risks as before. Signs of quick exhaustion at work, emotional instability, a tendency to fixate on failure and to painstakingly check what he has done (out of fear of missing a mistake), and attitudes of conformity and dependency as a reaction to the situation he has lived through are objectively evident. A somewhat lowered level of his functional mental state that is caused by high anxiety and excessive stress have been established.

Above all, this case demonstrates the disruption of an operator's fitness for work as a result of a sustained pronounced state of psychoemotional stress.

Observation 3. The patient is a 27-year-old military man who is an inspector at a checkpoint. He complains of weakness, headaches, and increased fatigue. His calculated time indicators for the analysis of simple sensorimotor reactions are as follows: functional system level, 4.6; response stability, 1.96; level of functional capabilities, 3.56. This corresponds to the mean level of the norm for the functional status of the CNS. His productivity and reliability as measured on the analysis of complex sensorimotor activity are adequate (productivity, 37 operations per minute; $t = 1.849$ seconds with $\sigma = 0.685$ seconds), and he acquires skills successfully. The indicators of the principal features of his attention and short-term memory are within the range of the norm.

His self-assessment of condition is very low, particularly with regard to disposition (state of health, 3.6; activity, 3.2; disposition, 1.6).

He manifests high degrees of reactive (score, 49) and personality (score, 58) anxiety. He is experiencing acutely painful difficulties in making decisions regarding his future. Some toughness in his thinking and thoroughness are evident. He manifests a pronounced state of emotional discomfort, instability, and uncertainty in himself with a high motivation to reach his goals, a tendency toward reactions of rejection, and difficulties in social adaptation.

His excessive self-criticism and the large rift between his actual and ideal "I" have led to a marked state of internal stress and low mood background. This neurotic conflict, which is inherent to his personality, has been intensified and reinforced by his poor grasp of his illness and the prognosis regarding the state of his health, the circumstances of his irradiation (he stood guard to no apparent benefit), and his protracted inability to help his own actual self-assessment or to test his strengths (for the past 9 months he has spent most of his time in the hospital and has not worked). This case thus demonstrates a pronounced neurotic conflict and a steadfast state of frustration in an emotionally labile personality (psychoasthenic traits) in the presence of a rather high level of basic mental functions.

Observation 4. The patient is a 30-year-old operator of a nitrogen-oxygen station. During the accident, he was at his workstation close to the accident site. He heard the roar and saw the flash. He completed his shift. He

presents a wealth of complaints regarding constant headaches, depressed mood, nightmares, poor noise endurance, irritability, fatigue, and a reduction in memory and attention span, as a result of which he cannot watch television or concentrate on reading. He is listless, forgetful, and fixated on the details of the history of his illness. He has difficulty recalling the sequence of events during the accident and begins stuttering. He notes that in the sanatorium the roar of aircraft remind him of the accident and then he "becomes afraid." He feels that nobody needs him. He has no plans for his future way of life or activities, saying "I have thought about it in general but quickly forget about it." His calculated time indicators for his simple sensorimotor reaction analysis are as follows: functional system level, 2.43; response stability, 0.92; level of functional capabilities, 0.11. This corresponds to a third-degree shift in functional status. His productivity on the analysis of complex sensorimotor activity is reduced (productivity, 26 operations per minute; $t = 2.556$ seconds with $\sigma = 0.944$ seconds), and his activation period has not been determined. The main features characterizing his attention and his self-assessment of condition are also reduced (state of health, 2.9; activity, 3.5; disposition, 4.5). He is experiencing anxiety (reactive, 43; personality, 46). He manifests signs of disintegration of his emotional and intellectual spheres and a marked fixation on the state of his health, as well as chaos and the absence of a proper system for analyzing phenomena. His functional mental state has been diagnosed as low, and asthenoneurotic syndrome has been established.

Thus, in the first case, proceeding from the results of the clinical psychological examination, the patient may be deemed fit for work without any restrictions. As for the second case of the ill, but fit-for-duty engineer who had been working in his specialty, it is not recommended that he be used for operator duties, including those without any contact with ionizing radiation. This could lead to a disruption of work and to a reduction in the operating safety of equipment, on the one hand, and an increase in the risk of the occurrence of psychosomatic pathology in the patient, on the other hand. The third patient needs psychological correction of the neurotic conflict underlying his psychoasthenic state (by giving him additional information about his state of health and a prognosis, helping him plot a life's program for the near future, and including him in work-related activity as quickly as possible). Treatment and psychotherapeutic assistance are needed in the fourth case. Only then can the question of his fitness for work and efficient job placement be answered.

Conclusions. 1. The different mental states and levels of fitness for work in patients suffering from minor-degree acute radiation sickness during the recovery period are a result not only of the features of the illness they have had, but also of a set of psychological factors specific to the accident and of the patient's personality traits and level of general and occupational knowledge.

2. Identifying the feature of patients' psychological state and objectivizing possible deadaptation disorders may provide needed material for expert assessment and prognosis of their health status and fitness for work, their occupational suitability, and the implementation of corrective and rehabilitative measures.

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Diagnosis, Clinical Picture and Treatment of Acute Radiation Sickness in Victims at the Chernobyl Nuclear Power Plant. Report II. Nonmedullary Syndromes of Radiation Injury and Their Treatment

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[Article by A. K. Guskova, A. Ye. Baranov, A. V. Barabanova, A. A. Moiseyev, Ye. K. Pyatkin, G. D. Selidovkin, and N. A. Metlyayeva (Moscow)]

[Text] By virtue of the unique conditions of exposure to ionizing radiation in the Chernobyl AES [nuclear power plant] accident, there was significant external exposure of the skin to beta and gamma radiation from a distance, as well as contact irradiation from particles of radioactive dust that settled on the skin and from wet clothing saturated with contaminated water and steam. For this reason, extensive radiation injuries to the skin caused by beta rays were a distinctive feature in victims of this accident.

Radiation burns in firefighters and casualties among the plant's personnel were observed only in combination with radiation injury to hemopoiesis; thus, they were a component part of the clinical syndrome of acute radiation sickness (ARS). This situation can be viewed as a variant of extremely uneven body-depth distribution of absorbed energy, when the dose to the skin was 10-20 times greater than the radiation dose to bone marrow.

This was confirmed by the existence of a certain parallelism in severity of injury in these two critical systems.

The table presents the distribution of cases of radiation burns to the skin in groups presenting with varying degrees of severity of the medullary syndrome (MS) of ARS.

Distribution of cases of radiation burns to the skin in the presence of varying degrees of severity of ARS medullary syndrome

		Extent of body surface involved			
Severity	Number of patients	50%	11-50%	1-10%	Total
IV	20	9	10	1	20
III	21	3	15	3	21
II	43	1	9	2	12
I	31	0	1	2	3
Totals	115	13	35	8	56

As can be seen in the table, more than half of all ARS cases had radiation injury to the skin, whereas every patient with the MS of grades III and IV severity has such injury to the skin.

The contribution that radiation skin injuries made to the severity of the overall clinical ARS syndrome was due not only to the extensiveness of the process, but also to the markedness of pathological changes, as well as to the duration of the course, with unique recurrences of the pathological process.

As a rule, each patient had burns over different parts of the body. The most frequent locations in the early period were the hands, face, neck and feet; later, there were burns on the chest, back, followed by injuries on the lower and upper legs and the buttocks. In some cases, the sequence was different.

Evolution of visible injuries was similar to that described previously by other authors,[2] but was more severe. The extensive hyperemia that occurred at first (primary erythema) was followed by a latent period by the third or fourth day. Secondary erythema developed on the fifth or sixth day in the most serious cases and between the eighth and 21st days in the majority of patients. Depending on the degree of injury, it ended with either dry (first-degree radiation burn) or moist (second-degree, with formation of blisters) epidermitis, or there was development of ulcerative-bullous and ulcerative-necrotic dermatitis (third- and fourth-degree burns). Epithelization of desquamative-erosive surfaces continued for 2-3 weeks after the appearance of visible skin changes. In six patients, healing of burns on areas of deep necrosis of the skin did not begin until the end of the second month. Appearance of secondary waves of erythema starting at the end of the fourth week of ARS (after the 21st day) to the 45th-60th days was a typical burn feature we were able to fully monitor in this group of victims. These changes were characterized by hyperemia on previously unchanged parts of the skin or intensification of clinical manifestations at the sites of "old," healing burns. For example, late secondary erythema appeared over the malleoli and feet or on the thighs and buttocks of patients who had "blooming" burns on the lower legs in the first three weeks. By the time this late erythema appeared, earlier erosions often were epithelized. Late erythema was usually accompanied by edema of subcutaneous fatty tissue, which was particularly noticeable when localized on the lower leg; it was painful to walk. Palpation of the skin and underlying tissues (muscles, tendons) was painful. In the most serious cases, fever and worsening of general condition were observed. Late secondary erythema was resolved within two weeks with topical therapy only. But in the most severe cases, one had to resort to additional therapeutic measures—for example, prescribing glucocorticoids, which eliminated rather rapidly both systemic and local manifestations of dermatitis.

As can be seen in the table, the extensiveness of burns in the ARS patients ranged from 1 to 100 percent of the body surface. It should be noted that when there were relatively early (on the fifth or sixth day) second- to third-degree burns over at least 30-40 percent of the body, with subsequent spread of hyperemia, they resulted in death. In 19 out of 56 patients with burns, the latter were, without question, fatal. With the appearance of early secondary erythema over more than 40 percent of the body, there was consistent development of, first, febrile-toxemic syndrome and then renal-hepatic insufficiency and encephalopathic coma with cerebral edema, which led to death 14-48 days after exposure to radiation. The pathogenetic link between fatal renal-hepatic insufficiency and cerebral coma, on the one hand, and skin burns, on the other, is confirmed by the fact that a similar evolution of these syndromes was also observed in several patients who had neither a serious MS nor the intestinal syndrome (IS). In most cases, however, fatal burns were combined with both extremely severe MS and severe acute radiation enteritis (IS).

IS was one of the most terrible manifestations of ARS. This syndrome began to develop between the fourth and eighth days in 10 patients. This was indicative of brief exposure to whole-body gamma radiation on the order of 10 Gy or more; all 10 patients died within the first three weeks after irradiation. Appearance of diarrhea after eight days (in seven individuals) was indicative of less severe injury. With intensive fluid-electrolyte-protein maintenance therapy, the manifestations of radiation enteritis that were present from the 10th to 25th days could not have been the sole or chief cause of death.

The buccopharyngeal syndrome (BPS)—acute radiation mucositis of the mouth and pharynx—was found in 80 patients. Its mildest manifestations (grades I and II severity) were characterized by desquamation and edema of the mucosa in the buccal and tongue region and by separation of the gums from the teeth. These symptoms were observed between the eighth and 25th

days. Erosions and ulcers of the oral mucosa, severe pain, and profuse gummy mucus that sometimes blocked the laryngeal vestibule and hindered breathing were the chief manifestations of more severe BPS (grades III and IV). The first symptoms appeared earlier, on the third or fourth day, and reached a peak on the 10th day, regressing after the 18th-20th day, with agranulocytosis still present. The process did not have selective localization, as is inherent in erosive-ulcerative injuries in the region of the palatine tonsils and gums in the presence of agranulocytosis. However, in a considerable number of cases, radiation mucositis was complicated by secondary bacterial and viral infection, which prolonged its course. The primary, early appearance (on the third or fourth day) of eruptions similar to herpes, which formed massive scabs on the lips and face, was typical in almost 30 and 80 percent of the cases with severe and extremely severe MS, respectively. In this group of patients, mainly with grade IV ARS, we also observed marked radiation parotitis with impaired salivation and high blood amylase levels between the first and fourth days. The enlarged parotid salivary glands reverted to normal size without special therapy, but restoration of secretion took more time.

Acute radiation pneumonia, which has been described in connection with whole-body therapeutic gamma irradiation of leukemia patients,[4] was observed in our situation in seven patients with grade III-IV ARS. Rapidly increasing dyspnea was a typical sign of this condition; with auscultation, pulmonary rales "rattled" like "a tin roof in the wind"; respiratory insufficiency progressed for two or three days; and there were lethal outcomes due to hypoxemic coma. Autopsy revealed large cyanotic lungs with marked interstitial edema, but without signs of destruction of the mucosa of the trachea or bronchi. Interstitial pneumonia usually developed a few days before death; it was combined with extremely severe injuries to the skin and intestine. Death occurred 14-30 days after irradiation.

All patients with grade III-IV MS had severe radiation burns. The incidence of other nonmedullary syndromes increased as the dose of whole-body radiation increased. Among patients whose illness led to death, the outcome could have been due to skin injuries in two-thirds of them (19 patients). However, in 14 patients, there was a combination of several serious syndromes, each of which could have been the cause of death. Five patients had neither radiation enteritis nor irreversible myelodepression, and the dose of whole-body exposure did not exceed 6 Gy. Thus, their death should be interpreted as being the result, exclusively, of radiation injuries to extensive parts of the skin. Radiation skin injuries are a typical manifestation of ARS as a result of severe exposure to nonuniform gamma and beta radiation. In this situation, the nonuniformity is due to the high dose gradient between the surface of the skin and the entire body.

Interstitial radiation pneumonia (in 7 patients) complicated by, apparently, secondary viral infection that was difficult to identify before death was of sole or leading significance.

IS and BPS were combined with other severe injuries in all patients of this group and had no independent significance in terms of the fatal outcome.

In six cases, death was due to irreversible radiation aplasia of hemopoiesis (cytopenia and its inherent infectious complications) or to complications after bone marrow transplantation (BMT). We are referring to a secondary illness—a set of immunological disorders related to acceptance of the transplant with retention of the patient's own myelopoiesis—or to additional depression of myelopoiesis and immunity by toxic components of the transplantation program.

Bleeding was the cause of death in only one case (hemothorax and hemoperitoneum triggered by mechanical trauma when catheterizing the subclavian vein).

In virtually all cases, shortly before death there were marked manifestations of severe endogenous intoxication as a result of extensive radiation destruction of tissues, aggravated by infectious and septic complications. This was manifested by functional insufficiency of the liver and kidneys, signs of dyscirculatory and toxic encephalopathy combined with respiratory and vascular insufficiency.

Treatment of radiation burns and other nonmedullary syndromes and their complications was a difficult and multifaceted problem.

A total of 15 hemoperfusion procedures were administered between the second and eighth days of illness to 13 patients with the most severe skin injuries. Three patients exposed to whole-body radiation of 2-4.6 Gy survived; they were treated by hemoperfusion once between the fifth and eighth days, i.e., considerably later than is recommended for treatment of the MS. This method of therapy did not affect duration or severity of pancytopenia.

During hemoperfusion—particularly by the end of the procedure—many patients reported brief (for several hours or a day) improvement of well-being, attenuation or disappearance of pain in involved limbs, as well as decrease in tissue edema. It is impossible to rule out the effect of the medication that accompanied the procedure.

Wider use was made of plasmapheresis in order to counteract the consistent development of renal and hepatic insufficiency and fatal encephalopathic coma. Severe beta-radiation burns to 30-40 percent of the body or more were an indication for it. Plasmapheresis was performed on 17 patients from the 18th day through the 37th day. Some were treated daily with this procedure as many times as six times a day.

The beneficial effect of repeated plasmapheresis was manifested by a reduction in bilirubinemia and transaminasemia and lower levels of nitrous sludge in the blood in the presence of burn-induced renal-hepatic syndrome. Some sessions of plasmapheresis were accompanied by mild reactions, in the form of chills and fever; there were no fatal complications. Infusion of 1000 ml fresh-frozen plasma against the backdrop of around-the-clock heparinization (1000 U/h), with fluid loading (2-6 l/day) and forced diuresis matching the administered volume of fluid, was another procedure used for burn-induced toxicosis. This was done on the assumption that subclinical or even sublaboratory (no typical coagulation-related disturbances) disseminated intravascular clotting was the chief cause of development of encephalopathy and the renal-hepatic syndrome. This methods was used in its strictest version on two patients, for 7-15 days. These patients survived somewhat longer than did the others with burns of similar severity and extensiveness. They had less marked renal-hepatic insufficiency; however, death due to encephalopathic coma could not be prevented.

A large team of surgeons and nurses was needed to apply dressings for topical treatment of burns. Various anti-inflammatory, bacteriostatic agents that stimulated regeneration were used. Lyoxanol aerosol, a burn ointment based on hydrocortisone with topical antibiotics, the Baliz-2 solution, and collagen coverings (combutec, an adhesive-remissive, and others) proved themselves well. In each individual case, medication was changed in accordance with the stage of the pathological process. Special mention should be made of experience with bactericidal fabric used both as dressing material and additional bed linen for patients with extensive burns. Other authors have also reported the beneficial properties of this material.[1]

Control of the pain syndrome was rather difficult, as it always is with radiation injuries, and it required much attention on the part of the physicians. It should be noted that local anesthetics were often ineffective.

Total parenteral feeding (based on alvesin hydrolysate or an amino acid mixture—aminon and 40 percent glucose as energy-supplying material)—had some beneficial effect in cases of serious radiation stomatitis and enteritis. Treatment was administered according to the guidelines and rules described by S. Dudrick and R. Ruberg.[3] We tested and tried the method for several years in the clinic, with good results, particularly in the case of whole-body therapeutic irradiation at a dose of 1000 rad for BMT. The main hazard, which was perhaps not fully assessed, was the probability of a hyperosmolar status in some seriously ill patient (in a coma). For this reason, it is absolutely mandatory to monitor osmolarity of plasma in the program of total parenteral feeding in the treatment of such patients.

In most patients with MS grades I-II, the phase of clinical recovery ended by the third or fourth month. Individuals with serious radiation burns and sequelae of grade III-IV MS required longer treatment. By the end of the fourth month following irradiation, a few patients remained in a specialized hospital with changes in the skin (areas of dystrophy and ulcerations with edema of subcellular fatty tissue, mainly on the lower legs and feet). They were treated with disaggregants and agents to improve local circulation and tissular trophics. Four patients had deep, extensive ulcers on the arms and other parts of the body, and they required repeated plastic surgery.

Some surviving patients with severe or extremely severe MS continued to show laboratory signs of an immune-deficient status, in particular, a low helper/suppressor ratio when subpopulations of T-lymphocytes were assayed using monoclonal antibodies. During this time, they did not develop any serious or life-threatening infections. In some cases, immunocorrective therapy with Tactivin and B-activin was tried.

Treatment of ARS patients required much effort on the part of hospital personnel with experience in managing such patients. Moreover, it became necessary to call upon the staff of other medical institutions, particularly mid-level personnel. There was a dramatic increase in the need for platelet concentrate and other blood products (albumin, plasma). It was necessary to quickly outfit some isolation wards with the most elementary devices to assure aseptic patient management.

Organization of the receiving room was a seriously difficult task because so many victims arrived whose clothing and integument were contaminated to varying degrees. It was necessary to set up optimal flows of arriving victims: those requiring decontamination, and those to be immediately hospitalized in the wards. It was also necessary to replenish supplies of detergents, disposable bedding and gowns for patients, footwear and clothing for personnel. A large amount of polyethylene film was needed to cover the floors of the receiving room, departments, wards and offices.

Personnel were equipped with thermoluminescent dosimeters to measure external radiation doses, and contamination of clothing, body and instruments was checked regularly. The radiation doses to which personnel were exposed did not exceed permissible levels. Gradually, appropriate behavior of staff and prescribed work regimen were achieved under conditions of real, though insignificant, radiation contamination.

In such a situation, it was very helpful that this medical institution had experience in managing such patients and skills in working in sterile wards, and mid-level personnel were trained in carrying out intensive care, including programs of BMT with irradiation of patients at doses of up to 10 Gy. Essentially, this clinic's physicians headed the work dealing with care of victims of the Chernobyl AES accident. In each department formed, the staffs of other institutions worked along with its own personnel.

The on-duty staffs were reinforced so that there would be a separate around-the-clock nurse and physician for

every 3-4 patients with grade III-IV ARS, particularly at the height of illness. Medical personnel worked in the evenings under the supervision of an experienced duty officer. Twice a day, the clinic chief or his deputy held a briefing for the personnel coming on duty and analyzed the most important aspects of the constantly changing clinical situation. This was also particularly important because physicians from various institutions were involved in the treatment process. In addition to the need for strict standardization of all procedural approaches and guidelines for assessing the response to therapy, the systematic analyses and examination at the end of the visits of physicians in the specialized hospital made it possible to provide the necessary advanced professional training to almost 200 physicians in 2-3 months.

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Scientific Basis for Health Norms and Risk Assessment of Combined Radiative and Nonradiative Factors

907C0510J Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 89 (manuscript received 6 May 88) pp 67-70

[Article by V.Ya. Golikov, Ye.P. Yermolina, and V.I. Usoltsev, Central Order of Lenin Advanced Training of Physicians Institute, Moscow; Leningrad Advanced Training of Physicians Institute imeni S. M. Kirov]

[Abstract] The Soviet Union has taken the lead in establishing safe exposure standards to various noxious agents, with special attention accorded to ionizing radiation. The current standards covered in the NRB-76/87 regulations take into consideration simultaneous multiple internal and external exposures, but are limited to radiative factors. Actually, however, workers and others are generally exposed to various adverse factors encompassing, in addition, noise, vibration, electromagnetic fields, electrical charges, chemicals, products of radiolysis, and so forth. Safety standards for nonradiative factors are based on the threshold concept, which in the case of radiative factors is applicable only to nonstochastic effects. However, with stochastic effects dose-effect relationships are employed. Consequently, it may well be that overall morbidity may constitute the best indicator of the combined action of ionizing radiation and other factors. References 30: 27 Russian, 3 Western.

AIDS—Acquired Immune Deficiency Syndrome

907C0385E Kiev MIKROBIOLOGICHESKIYE ZHURNAL in Russian Vol 51 No 5, Sep-Oct 89 pp 97-98

[Article by V. P. Shirobokov, A. I. Yevtushenko, N. M. Kovaleva et al.]

[Abstract] This book, reviewed by G. K. Paliy and A. A. Chesnokova, is the first monograph on AIDS published in the USSR. The book consists of an introduction, 6 sections, a conclusion and a list of 704 references. The introduction presents a detailed description of the global nature and complexity of AIDS and the universal tendency of the spread of the disease. Section 1 describes basic stages of the history of the discovery of the AIDS virus, the origin and evolution of the pathogen and a detailed description of its structure. Chapter 2 describes the epidemiology of AIDS. The section "Pathogenesis and Immunity" presents data concerning the location of the AIDS pathogen in the body, mechanisms which play a role in development of immunity, and hypotheses explaining pathogenetic mechanisms of AIDS. Factors which promote immunosuppression during AIDS are discussed. The book presents extensive materials concerning the taxonomic position of pathogens of opportunistic infections of different etiology during AIDS. It describes clearly the clinic, criteria of diagnosis of AIDS, stages of development of the disease, diagnosis and treatment. The section "Laboratory Diagnosis" assesses methods of indicating the AIDS virus, detecting antivirus antibodies and determining specific changes in the immune system. The book describes measures of nonspecific prophylaxis in detail. The complete legislative documents (Decree of the Presidium of the Supreme Soviet USSR "Measures For Preventing Infection by the AIDS Virus", 1987 and "Rules of Medical Examination to Detect Infection by the AIDS Virus", 1987) are found in the book. Protective measures for attending medical personnel are given. The conclusion briefly formulates the most important regularities of the pathogenesis of AIDS and reports on development of effective therapeutic and prophylactic drugs both in the USSR and abroad.

UDC 578.832.1.083.22

Isolation and Characterization of Cloned Variants of Influenza A/USSR/13/81 (H1N1-N3) Virus

907C0550A Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 6, Nov-Dec 89 (manuscript received 1 Aug 88) pp 669-675

[Article by L. M. Fursova, Z. K. Chuvakova and Ye. S. Isayeva, Institute of Microbiology and Virology, Kazakh Soviet Socialist Republic Academy of Sciences, Alma-Ata]

[Abstract] The cloning of influenza virus A/USSR/13/81 (H1N1-N3), isolated postmortem from a pediatric case, in chick embryo and MDCK cells yielded three clones that differed in their antigenic, biological, and physicochemical properties. Extensive serologic analyses revealed that the hemagglutinin in the case of one clone was antigenically similar to that of virus A/PR8/34 while neuraminidase was analogous to the N3 subtype. A second clone shared hemagglutinin with A/WS/33 and neuraminidase was of the N1 subtype, and the third expressed the hemagglutinin of the isolate and neuraminidase subtypes of the other two clones. The isolate A/USSR/13/81 was thus shown to consist of a heterogenous population of viruses. Figures 3; tables 2; references 18: 13 Russian, 5 Western.

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Experimental Masking of Human Immunodeficiency Virus Antigen by Specific Antibodies

907C0550C Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 6, Nov-Dec 89 (manuscript received 11 Aug 88) pp 679-684

[Article by G. N. Trushinskaya, V. E. Berezin, S. Yu. Klyushnik, S. S. Marennikova, and V. M. Zaydes, Institute of Virology imeni D. I. Ivanovskiy and Scientific Research Institute of Viral Preparations, USSR Academy of Medical Sciences, Moscow]

[Abstract] In vitro studies relying on competitive immunoenzyme assay technology were used to assess antigenic masking phenomenon of human immunodeficiency virus (HIV) and anti-HIV antibodies. The use of an immunoenzyme assay system with a sensitivity of 1 ng/ml demonstrated that patient serum in dilutions of 1:50 to 1:200 masked the antigen. The antibody concentration that resulted in masking was far lower than that in the plasma levels observed in patients, and may account for clinically false-negative cases. Subsequent seroconversion to a positive status may be due to a fall in antibody titers due to debilitation and generalized immunodeficiency. Figures 4; references 20: 3 Russian, 17 Western.

UDC 578.833.26:578.74].083.3

Immunofluorescent Antigenic Analysis of Tick-Borne Encephalitis Viruses Using Monoclonal Antibodies

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[Article by S. Ya. Gaydamovich, N. A. Sveshnikova, D. R. Stephenson, J. M. Lee and Ye. E. Melnikova, Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow; Center for Applied Microbiology and Research, Porton Down, Salisbury, Great Britain]

[Abstract] Immunofluorescence studies with 18 IgG monoclonal antibodies against the E and NS1 antigens of

tick-borne encephalitis virus when tested against tick-borne encephalitis complex viruses, revealed a greater degree of cross-reaction with anti-E antibodies than with anti-NS1 antibodies. The study also revealed that release of the NS1 antigen from cells began 18 h after infection and that the release continued throughout the entire replicative period. The E antigen, on the other hand, continued to accumulate in the cytoplasm. These observations also suggest that the anti-E and anti-NS1 monoclonal antibodies may be used as diagnostic reagents. Tables 4; references 14: 6 Russian, 8 Western.

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Effects of Specific and Nonspecific Transfer Factors on Experimental Tick-Borne Encephalitis

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[Article by V. V. Pogodina, L. S. Levina, N. P. Perepechkina and A. N. Mats, Institute of Poliomyelitis and Viral Encephalitides and Scientific Research Institute of Vaccines and Sera imeni I. I. Mechnikov, USSR Academy of Medical Sciences, Moscow]

[Abstract] Therapeutic trials were conducted with specific and nonspecific transfer factors in Syrian hamsters infected with tick- borne encephalitis virus. Specific transfer factor was derived from the lymphocytes of patients recovering from tick-borne encephalitis, while nonspecific preparations were obtained from lymphocytes secured during tonsillectomy in patients residing outside an endemic area. The four- week old animals were infected subcutaneously, followed by either footpad administration of nonspecific transfer factor or intraperitoneal administration of specific transfer factor. In general, transfer factor treatment led to exacerbation of the pathologic process and reduction of survival times. Nevertheless, in certain experimental administrations of transfer factor 72 h after the viral challenge survival times increased by 2.0 to 4.3 days and mortality diminished. Additional observations included reduced viral titers in the brain and especially in the spleen. These findings demonstrated that the clinical effects of transfer factor in tick-borne encephalitis were variable and for the most part adverse. However, with certain dosage and time combinations beneficial effects may be anticipated. Figures 3; tables 3; references 21: 8 Russian, 13 Western.

UDC 578.833.26:578.1:577.112].083.2

Changes in Biological Properties of Tick-Borne Encephalitis Virus Following Cleavage of Disulfide Bonds in Protein E

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[Article by M. F. Vorovich, A. V. Timofeyev, D. G. Maldov, V. I. Khaustov and L. B. Elbert, Institute of Poliomyelitis and Viral Encephalitides, USSR Academy of Medical Sciences, Moscow]

[Abstract] A study was conducted on the biological sequelae of cleavage of the disulfide bonds in protein E of tick-borne encephalitis virus. Reduction was accomplished by treatment of the virus with dithiothreitol in tris-HCl buffer for 1 h at 37°C. Although ultrastructural analysis of the treated tick-borne encephalitis virus failed to reveal any changes, the virus lost antigenic specificity, infectivity, and hemagglutinating activity. The loss of infectivity was attributed to failure of the virus to interact with cell receptors. Attempts at recovery of activity by incubation in 0.1 percent human serum albumin for 3 days at 4°C in air or nitrogen were unsuccessful, demonstrating that the conformational changes in protein E were too profound to be reversible. These findings point to the importance of the tertiary structure of protein E in tick-borne encephalitis virus biology and as a factor in vaccine preparation. Figures 2; references 14: 5 Russian, 9 Western.

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